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(54) **LUMINESCENT COMPOUNDS WITH CARBENE LIGANDS**

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This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

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(51) **Int. Cl.**
H01L 51/54 (2006.01)
C09K 11/06 (2006.01)

(52) **U.S. Cl.** **428/690**; 428/917; 313/504; 257/40; 257/E51.044

(58) **Field of Classification Search** .... None
See application file for complete search history.

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(57) **ABSTRACT**

An organic light emitting device is provided. The device has an anode, a cathode and an organic layer disposed between the anode and the cathode. The organic layer comprises a compound further comprising one or more carbene ligands coordinated to a metal center.

23 Claims, 44 Drawing Sheets

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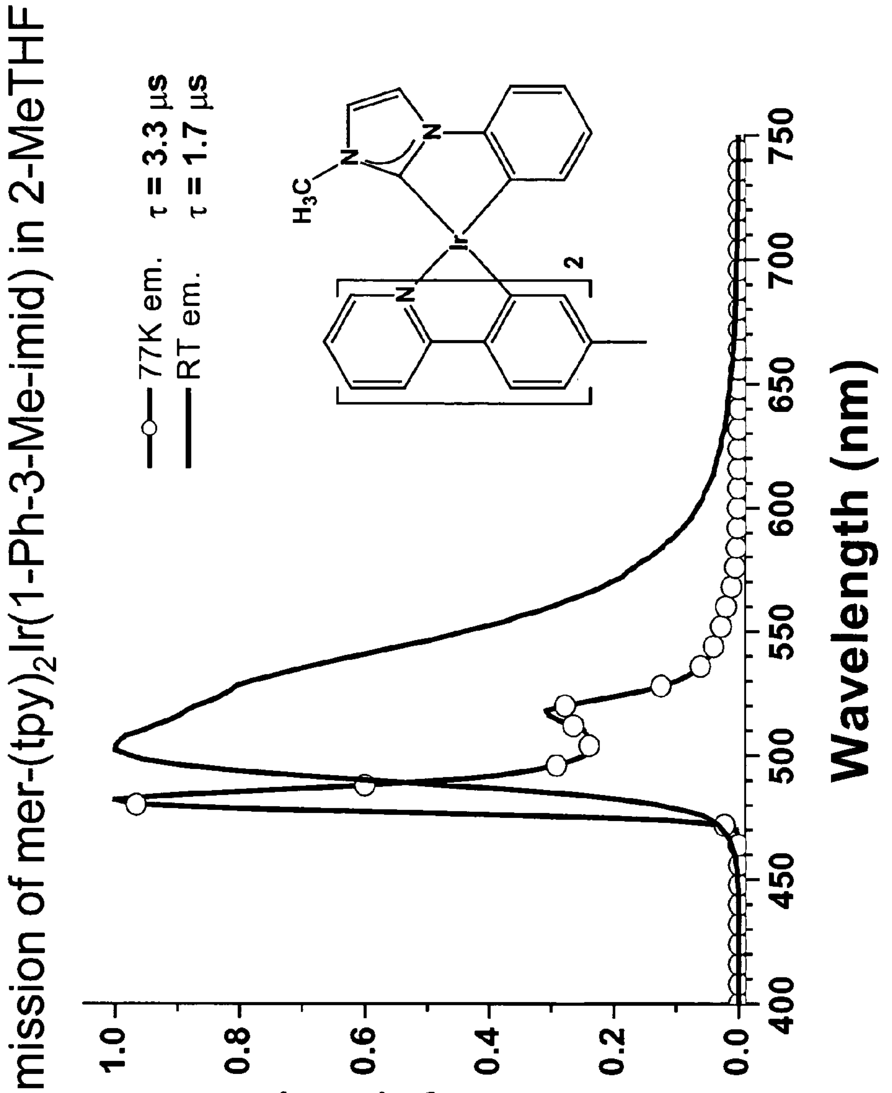

Emission of mer-(tpy)$_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF
77K em. τ = 3.3 μs
RT em. τ = 1.7 μs
Intensity (a.u.)
Wavelength (nm)
0.0
0.2
0.4
0.6
0.8
1.0
400
450
500
550
600
650
700
750
H$_3$C
N
Ir
2

Figure 9

TABLE 15-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
15-206	Me	H	Ph	H	H	Me	H	H	H	H	H	H	H
15-207	Me	H	Ph	H	H	H	Me	H	H	H	H	H	H
15-208	Me	H	Ph	H	H	H	H	Me	H	H	H	H	H
15-209	Me	H	Ph	H	H	H	H	H	Me	H	H	H	H
15-210	Me	H	Ph	H	H	H	H	H	H	Me	H	H	H
15-211	Me	H	Ph	H	H	H	H	H	H	H	Me	H	H
15-212	Me	H	Ph	H	H	H	H	H	H	H	H	Me	H
15-213	Me	H	Ph	H	H	H	H	H	H	H	H	H	Me
15-214	Me	H	Ph	H	H	Ph	H	H	H	H	H	H	H
15-215	Me	H	Ph	H	H	H	Ph	H	H	H	H	H	H
15-216	Me	H	Ph	H	H	H	H	Ph	H	H	H	H	H
15-217	Me	H	Ph	H	H	H	H	H	Ph	H	H	H	H
15-218	Me	H	Ph	H	H	H	H	H	H	Ph	H	H	H
15-219	Me	H	Ph	H	H	H	H	H	H	H	Ph	H	H
15-220	Me	H	Ph	H	H	H	H	H	H	H	H	Ph	H
15-221	Me	H	Ph	H	H	H	H	H	H	H	H	H	Ph
15-222	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H
15-223	Ph	H	Ph	H	H	Me	H	H	H	H	H	H	H
15-224	Ph	H	Ph	H	H	H	Me	H	H	H	H	H	H
15-225	Ph	H	Ph	H	H	H	H	Me	H	H	H	H	H
15-226	Ph	H	Ph	H	H	H	H	H	Me	H	H	H	H
15-227	Ph	H	Ph	H	H	H	H	H	H	Me	H	H	H
15-228	Ph	H	Ph	H	H	H	H	H	H	H	Me	H	H
15-229	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	H
15-230	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Me
15-231	Ph	H	Ph	H	H	Ph	H	H	H	H	H	H	H
15-232	Ph	H	Ph	H	H	H	Ph	H	H	H	H	H	H
15-233	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H	H
15-234	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H	H
15-235	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H	H
15-236	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H	H
15-237	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph	H
15-238	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Ph
15-239	Me	H	H	Ph	H	H	H	H	H	H	H	H	H
15-240	Me	H	H	Ph	H	Me	H	H	H	H	H	H	H
15-241	Me	H	H	Ph	H	H	Me	H	H	H	H	H	H
15-242	Me	H	H	Ph	H	H	H	Me	H	H	H	H	H
15-243	Me	H	H	Ph	H	H	H	H	Me	H	H	H	H
15-244	Me	H	H	Ph	H	H	H	H	H	Me	H	H	H
15-245	Me	H	H	Ph	H	H	H	H	H	H	Me	H	H
15-246	Me	H	H	Ph	H	H	H	H	H	H	H	Me	H
15-247	Me	H	H	Ph	H	H	H	H	H	H	H	H	Me
15-248	Me	H	H	Ph	H	Ph	H	H	H	H	H	H	H
15-249	Me	H	H	Ph	H	H	Ph	H	H	H	H	H	H
15-250	Me	H	H	Ph	H	H	H	Ph	H	H	H	H	H
15-251	Me	H	H	Ph	H	H	H	H	Ph	H	H	H	H
15-252	Me	H	H	Ph	H	H	H	H	H	Ph	H	H	H
15-253	Me	H	H	Ph	H	H	H	H	H	H	Ph	H	H
15-254	Me	H	H	Ph	H	H	H	H	H	H	H	Ph	H
15-255	Me	H	H	Ph	H	H	H	H	H	H	H	H	Ph
15-256	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H
15-257	Ph	H	H	Ph	H	Me	H	H	H	H	H	H	H
15-258	Ph	H	H	Ph	H	H	Me	H	H	H	H	H	H
15-259	Ph	H	H	Ph	H	H	H	Me	H	H	H	H	H
15-260	Ph	H	H	Ph	H	H	H	H	Me	H	H	H	H
15-261	Ph	H	H	Ph	H	H	H	H	H	Me	H	H	H
15-262	Ph	H	H	Ph	H	H	H	H	H	H	Me	H	H
15-263	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	H
15-264	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Me
15-265	Ph	H	H	Ph	H	Ph	H	H	H	H	H	H	H
15-266	Ph	H	H	Ph	H	H	Ph	H	H	H	H	H	H
15-267	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H	H
15-268	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H	H
15-269	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H	H
15-270	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H	H
15-271	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph	H
15-272	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Ph
15-273	Me	H	H	H	Ph	H	H	H	H	H	H	H	H
15-274	Me	H	H	H	Ph	Me	H	H	H	H	H	H	H
15-275	Me	H	H	H	Ph	H	Me	H	H	H	H	H	H
15-276	Me	H	H	H	Ph	H	H	Me	H	H	H	H	H
15-277	Me	H	H	H	Ph	H	H	H	Me	H	H	H	H
15-278	Me	H	H	H	Ph	H	H	H	H	Me	H	H	H
15-279	Me	H	H	H	Ph	H	H	H	H	H	Me	H	H
15-280	Me	H	H	H	Ph	H	H	H	H	H	H	Me	H
15-281	Me	H	H	H	Ph	H	H	H	H	H	H	H	Me
15-282	Me	H	H	H	Ph	Ph	H	H	H	H	H	H	H
15-283	Me	H	H	H	Ph	H	Ph	H	H	H	H	H	H

TABLE 15-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
15-284	Me	H	H	H	Ph	H	H	Ph	H	H	H	H	H
15-285	Me	H	H	H	Ph	H	H	H	Ph	H	H	H	H
15-286	Me	H	H	H	Ph	H	H	H	H	Ph	H	H	H
15-287	Me	H	H	H	Ph	H	H	H	H	H	Ph	H	H
15-288	Me	H	H	H	Ph	H	H	H	H	H	H	Ph	H
15-289	Me	H	H	H	Ph	H	H	H	H	H	H	H	Ph
15-290	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H
15-291	Ph	H	H	H	Ph	Me	H	H	H	H	H	H	H
15-292	Ph	H	H	H	Ph	H	Me	H	H	H	H	H	H
15-293	Ph	H	H	H	Ph	H	H	Me	H	H	H	H	H
15-294	Ph	H	H	H	Ph	H	H	H	Me	H	H	H	H
15-295	Ph	H	H	H	Ph	H	H	H	H	Me	H	H	H
15-296	Ph	H	H	H	Ph	H	H	H	H	H	Me	H	H
15-297	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	H
15-298	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Me
15-299	Ph	H	H	H	Ph	Ph	H	H	H	H	H	H	H
15-300	Ph	H	H	H	Ph	H	Ph	H	H	H	H	H	H
15-301	Ph	H	H	H	Ph	H	H	Ph	H	H	H	H	H
15-302	Ph	H	H	H	Ph	H	H	H	Ph	H	H	H	H
15-303	Ph	H	H	H	Ph	H	H	H	H	Ph	H	H	H
15-304	Ph	H	H	H	Ph	H	H	H	H	H	Ph	H	H
15-305	Ph	H	H	H	Ph	H	H	H	H	H	H	Ph	H
15-306	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Ph

TABLE 16

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2
16-1	Me	H	H	H	H	H	H	H	H
16-2	Me	H	H	H	H	H	H	Me	H
16-3	Me	H	H	H	H	H	H	H	Me
16-4	Me	H	H	H	H	H	H	Ph	H
16-5	Me	H	H	H	H	H	H	H	Ph
16-6	Ph	H	H	H	H	H	H	H	H
16-7	Ph	H	H	H	H	H	H	Me	H
16-8	Ph	H	H	H	H	H	H	H	Me
16-9	Ph	H	H	H	H	H	H	Ph	H
16-10	Ph	H	H	H	H	H	H	H	Ph
16-11	Me	Me	H	H	H	H	H	H	H
16-12	Me	Me	H	H	H	H	H	Me	H
16-13	Me	Me	H	H	H	H	H	H	Me
16-14	Me	Me	H	H	H	H	H	Ph	H
16-15	Me	Me	H	H	H	H	H	H	Ph
16-16	Ph	Me	H	H	H	H	H	H	H
16-17	Ph	Me	H	H	H	H	H	Me	H
16-18	Ph	Me	H	H	H	H	H	H	Me
16-19	Ph	Me	H	H	H	H	H	Ph	H
16-20	Ph	Me	H	H	H	H	H	H	Ph
16-21	Me	H	Me	H	H	H	H	H	H
16-22	Me	H	Me	H	H	H	H	Me	H
16-23	Me	H	Me	H	H	H	H	H	Me
16-24	Me	H	Me	H	H	H	H	Ph	H
16-25	Me	H	Me	H	H	H	H	H	Ph
16-26	Ph	H	Me	H	H	H	H	H	H
16-27	Ph	H	Me	H	H	H	H	Me	H
16-28	Ph	H	Me	H	H	H	H	H	Me
16-29	Ph	H	Me	H	H	H	H	Ph	H
16-30	Ph	H	Me	H	H	H	H	H	Ph
16-31	Me	H	H	Me	H	H	H	H	H
16-32	Me	H	H	Me	H	H	H	Me	H
16-33	Me	H	H	Me	H	H	H	H	Me
16-34	Me	H	H	Me	H	H	H	Ph	H
16-35	Me	H	H	Me	H	H	H	H	Ph
16-36	Ph	H	H	Me	H	H	H	H	H
16-37	Ph	H	H	Me	H	H	H	Me	H
16-38	Ph	H	H	Me	H	H	H	H	Me
16-39	Ph	H	H	Me	H	H	H	Ph	H
16-40	Ph	H	H	Me	H	H	H	H	Ph
16-41	Me	H	H	H	Me	H	H	H	H
16-42	Me	H	H	H	Me	H	H	Me	H
16-43	Me	H	H	H	Me	H	H	H	Me
16-44	Me	H	H	H	Me	H	H	Ph	H
16-45	Me	H	H	H	Me	H	H	H	Ph
16-46	Ph	H	H	H	Me	H	H	H	H

TABLE 16-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2
16-47	Ph	H	H	H	Me	H	H	Me	H
16-48	Ph	H	H	H	Me	H	H	H	Me
16-49	Ph	H	H	H	Me	H	H	Ph	H
16-50	Ph	H	H	H	Me	H	H	H	Ph
16-51	Me	H	H	H	H	Me	H	H	H
16-52	Me	H	H	H	H	Me	H	Me	H
16-53	Me	H	H	H	H	Me	H	H	Me
16-54	Me	H	H	H	H	Me	H	Ph	H
16-55	Me	H	H	H	H	Me	H	H	Ph
16-56	Ph	H	H	H	H	Me	H	H	H
16-57	Ph	H	H	H	H	Me	H	Me	H
16-58	Ph	H	H	H	H	Me	H	H	Me
16-59	Ph	H	H	H	H	Me	H	Ph	H
16-60	Ph	H	H	H	H	Me	H	H	Ph
16-61	Me	H	H	H	H	H	Me	H	H
16-62	Me	H	H	H	H	H	Me	Me	H
16-63	Me	H	H	H	H	H	Me	H	Me
16-64	Me	H	H	H	H	H	Me	Ph	H
16-65	Me	H	H	H	H	H	Me	H	Ph
16-66	Ph	H	H	H	H	H	Me	H	H
16-67	Ph	H	H	H	H	H	Me	Me	H
16-68	Ph	H	H	H	H	H	Me	H	Me
16-69	Ph	H	H	H	H	H	Me	Ph	H
16-70	Ph	H	H	H	H	H	Me	H	Ph
16-71	Me	Ph	H	H	H	H	H	H	H
16-72	Me	Ph	H	H	H	H	H	Me	H
16-73	Me	Ph	H	H	H	H	H	H	Me
16-74	Me	Ph	H	H	H	H	H	Ph	H
16-75	Me	Ph	H	H	H	H	H	H	Ph
16-76	Ph	Ph	H	H	H	H	H	H	H
16-77	Ph	Ph	H	H	H	H	H	Me	H
16-78	Ph	Ph	H	H	H	H	H	H	Me
16-79	Ph	Ph	H	H	H	H	H	Ph	H
16-80	Ph	Ph	H	H	H	H	H	H	Ph
16-81	Me	H	Ph	H	H	H	H	H	H
16-82	Me	H	Ph	H	H	H	H	Me	H
16-83	Me	H	Ph	H	H	H	H	H	Me
16-84	Me	H	Ph	H	H	H	H	Ph	H
16-85	Me	H	Ph	H	H	H	H	H	Ph
16-86	Ph	H	Ph	H	H	H	H	H	H
16-87	Ph	H	Ph	H	H	H	H	Me	H
16-88	Ph	H	Ph	H	H	H	H	H	Me
16-89	Ph	H	Ph	H	H	H	H	Ph	H
16-90	Ph	H	Ph	H	H	H	H	H	Ph
16-91	Me	H	H	Ph	H	H	H	H	H
16-92	Me	H	H	Ph	H	H	H	Me	H

TABLE 16-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2
16-93	Me	H	H	Ph	H	H	H	H	Me
16-94	Me	H	H	Ph	H	H	H	Ph	H
16-95	Me	H	H	Ph	H	H	H	H	Ph
16-96	Ph	H	H	Ph	H	H	H	H	H
16-97	Ph	H	H	Ph	H	H	H	Me	H
16-98	Ph	H	H	Ph	H	H	H	H	Me
16-99	Ph	H	H	Ph	H	H	H	Ph	H
16-100	Ph	H	H	Ph	H	H	H	H	Ph
16-101	Me	H	H	H	Ph	H	H	H	H
16-102	Me	H	H	H	Ph	H	H	Me	H
16-103	Me	H	H	H	Ph	H	H	H	Me
16-104	Me	H	H	H	Ph	H	H	Ph	H
16-105	Me	H	H	H	Ph	H	H	H	Ph
16-106	Ph	H	H	H	Ph	H	H	H	H
16-107	Ph	H	H	H	Ph	H	H	Me	H
16-108	Ph	H	H	H	Ph	H	H	H	Me
16-109	Ph	H	H	H	Ph	H	H	Ph	H
16-110	Ph	H	H	H	Ph	H	H	H	Ph
16-111	Me	H	H	H	H	Ph	H	H	H
16-112	Me	H	H	H	H	Ph	H	Me	H

TABLE 16-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2
16-113	Me	H	H	H	H	Ph	H	H	Me
16-114	Me	H	H	H	H	Ph	H	Ph	H
16-115	Me	H	H	H	H	Ph	H	H	Ph
16-116	Ph	H	H	H	H	Ph	H	H	H
16-117	Ph	H	H	H	H	Ph	H	Me	H
16-118	Ph	H	H	H	H	Ph	H	H	Me
16-119	Ph	H	H	H	H	Ph	H	Ph	H
16-120	Ph	H	H	H	H	Ph	H	H	Ph
16-121	Me	H	H	H	H	H	Ph	H	H
16-122	Me	H	H	H	H	H	Ph	Me	H
16-123	Me	H	H	H	H	H	Ph	H	Me
16-124	Me	H	H	H	H	H	Ph	Ph	H
16-125	Me	H	H	H	H	H	Ph	H	Ph
16-126	Ph	H	H	H	H	H	Ph	H	H
16-127	Ph	H	H	H	H	H	Ph	Me	H
16-128	Ph	H	H	H	H	H	Ph	H	Me
16-129	Ph	H	H	H	H	H	Ph	Ph	H
16-130	Ph	H	H	H	H	H	Ph	H	Ph

TABLE 17

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4
17-1	Me	H	H	H	H	H	H	H	H	H	H
17-2	Me	H	H	H	H	H	H	Me	H	H	H
17-3	Me	H	H	H	H	H	H	H	Me	H	H
17-4	Me	H	H	H	H	H	H	H	H	Me	H
17-5	Me	H	H	H	H	H	H	H	H	H	Me
17-6	Me	H	H	H	H	H	H	Ph	H	H	H
17-7	Me	H	H	H	H	H	H	H	Ph	H	H
17-8	Me	H	H	H	H	H	H	H	H	Ph	H
17-9	Me	H	H	H	H	H	H	H	H	H	Ph
17-10	Ph	H	H	H	H	H	H	H	H	H	H
17-11	Ph	H	H	H	H	H	H	Me	H	H	H
17-12	Ph	H	H	H	H	H	H	H	Me	H	H
17-13	Ph	H	H	H	H	H	H	H	H	Me	H
17-14	Ph	H	H	H	H	H	H	H	H	H	Me
17-15	Ph	H	H	H	H	H	H	Ph	H	H	H
17-16	Ph	H	H	H	H	H	H	H	Ph	H	H
17-17	Ph	H	H	H	H	H	H	H	H	Ph	H
17-18	Ph	H	H	H	H	H	H	H	H	H	Ph
17-19	Me	Me	H	H	H	H	H	H	H	H	H
17-20	Me	Me	H	H	H	H	H	Me	H	H	H
17-21	Me	Me	H	H	H	H	H	H	Me	H	H
17-22	Me	Me	H	H	H	H	H	H	H	Me	H
17-23	Me	Me	H	H	H	H	H	H	H	H	Me
17-24	Me	Me	H	H	H	H	H	Ph	H	H	H
17-25	Me	Me	H	H	H	H	H	H	Ph	H	H
17-26	Me	Me	H	H	H	H	H	H	H	Ph	H
17-27	Me	Me	H	H	H	H	H	H	H	H	Ph
17-28	Ph	Me	H	H	H	H	H	H	H	H	H
17-29	Ph	Me	H	H	H	H	H	Me	H	H	H
17-30	Ph	Me	H	H	H	H	H	H	Me	H	H
17-31	Ph	Me	H	H	H	H	H	H	H	Me	H
17-32	Ph	Me	H	H	H	H	H	H	H	H	Me
17-33	Ph	Me	H	H	H	H	H	Ph	H	H	H
17-34	Ph	Me	H	H	H	H	H	H	Ph	H	H
17-35	Ph	Me	H	H	H	H	H	H	H	Ph	H
17-36	Ph	Me	H	H	H	H	H	H	H	H	Ph
17-37	Me	H	Me	H	H	H	H				
17-38	Me	H	Me	H	H	H	H	Me	H	H	H
17-39	Me	H	Me	H	H	H	H	H	Me	H	H
17-40	Me	H	Me	H	H	H	H	H	H	Me	H
17-41	Me	H	Me	H	H	H	H	H	H	H	Me
17-42	Me	H	Me	H	H	H	H	Ph	H	H	H
17-43	Me	H	Me	H	H	H	H	H	Ph	H	H
17-44	Me	H	Me	H	H	H	H	H	H	Ph	H
17-45	Me	H	Me	H	H	H	H	H	H	H	Ph
17-46	Ph	H	Me	H	H	H	H	H	H	H	H
17-47	Ph	H	Me	H	H	H	H	Me	H	H	H
17-48	Ph	H	Me	H	H	H	H	H	Me	H	H
17-49	Ph	H	Me	H	H	H	H	H	H	Me	H
17-50	Ph	H	Me	H	H	H	H	H	H	H	Me

TABLE 17-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4
17-51	Ph	H	Me	H	H	H	H	Ph	H	H	H
17-52	Ph	H	Me	H	H	H	H	H	Ph	H	H
17-53	Ph	H	Me	H	H	H	H	H	H	Ph	H
17-54	Ph	H	Me	H	H	H	H	H	H	H	Ph
17-55	Me	H	H	Me	H	H	H	H	H	H	H
17-56	Me	H	H	Me	H	H	H	Me	H	H	H
17-57	Me	H	H	Me	H	H	H	H	Me	H	H
17-58	Me	H	H	Me	H	H	H	H	H	Me	H
17-59	Me	H	H	Me	H	H	H	H	H	H	Me
17-60	Me	H	H	Me	H	H	H	Ph	H	H	H
17-61	Me	H	H	Me	H	H	H	H	Ph	H	H
17-62	Me	H	H	Me	H	H	H	H	H	Ph	H
17-63	Me	H	H	Me	H	H	H	H	H	H	Ph
17-64	Ph	H	H	Me	H	H	H	H	H	H	H
17-65	Ph	H	H	Me	H	H	H	Me	H	H	H
17-66	Ph	H	H	Me	H	H	H	H	Me	H	H
17-67	Ph	H	H	Me	H	H	H	H	H	Me	H
17-68	Ph	H	H	Me	H	H	H	H	H	H	Me
17-69	Ph	H	H	Me	H	H	H	Ph	H	H	H
17-70	Ph	H	H	Me	H	H	H	H	Ph	H	H
17-71	Ph	H	H	Me	H	H	H	H	H	Ph	H
17-72	Ph	H	H	Me	H	H	H	H	H	H	Ph
17-73	Me	H	H	H	Me	H	H	H	H	H	H
17-74	Me	H	H	H	Me	H	H	Me	H	H	H
17-75	Me	H	H	H	Me	H	H	H	Me	H	H
17-76	Me	H	H	H	Me	H	H	H	H	Me	H
17-77	Me	H	H	H	Me	H	H	H	H	H	Me
17-78	Me	H	H	H	Me	H	H	Ph	H	H	H
17-79	Me	H	H	H	Me	H	H	H	Ph	H	H
17-80	Me	H	H	H	Me	H	H	H	H	Ph	H
17-81	Me	H	H	H	Me	H	H	H	H	H	Ph
17-82	Ph	H	H	H	Me	H	H	H	H	H	H
17-83	Ph	H	H	H	Me	H	H	Me	H	H	H
17-84	Ph	H	H	H	Me	H	H	H	Me	H	H
17-85	Ph	H	H	H	Me	H	H	H	H	Me	H
17-86	Ph	H	H	H	Me	H	H	H	H	H	Me
17-87	Ph	H	H	H	Me	H	H	Ph	H	H	H
17-88	Ph	H	H	H	Me	H	H	H	Ph	H	H
17-89	Ph	H	H	H	Me	H	H	H	H	Ph	H
17-90	Ph	H	H	H	Me	H	H	H	H	H	Ph
17-91	Me	H	H	H	H	Me	H	H	H	H	H
17-92	Me	H	H	H	H	Me	H	Me	H	H	H
17-93	Me	H	H	H	H	Me	H	H	Me	H	H
17-94	Me	H	H	H	H	Me	H	H	H	Me	H
17-95	Me	H	H	H	H	Me	H	H	H	H	Me
17-96	Me	H	H	H	H	Me	H	Ph	H	H	H
17-97	Me	H	H	H	H	Me	H	H	Ph	H	H
17-98	Me	H	H	H	H	Me	H	H	H	Ph	H
17-99	Me	H	H	H	H	Me	H	H	H	H	Ph
17-100	Ph	H	H	H	H	Me	H	H	H	H	H
17-101	Ph	H	H	H	H	Me	H	Me	H	H	H
17-102	Ph	H	H	H	H	Me	H	H	Me	H	H
17-103	Ph	H	H	H	H	Me	H	H	H	Me	H
17-104	Ph	H	H	H	H	Me	H	H	H	H	Me
17-105	Ph	H	H	H	H	Me	H	Ph	H	H	H
17-106	Ph	H	H	H	H	Me	H	H	Ph	H	H
17-107	Ph	H	H	H	H	Me	H	H	H	Ph	H
17-108	Ph	H	H	H	H	Me	H	H	H	H	Ph
17-109	Me	H	H	H	H	H	Me	H	H	H	H
17-110	Me	H	H	H	H	H	Me	Me	H	H	H
17-111	Me	H	H	H	H	H	Me	H	Me	H	H
17-112	Me	H	H	H	H	H	Me	H	H	Me	H
17-113	Me	H	H	H	H	H	Me	H	H	H	Me
17-114	Me	H	H	H	H	H	Me	Ph	H	H	H
17-115	Me	H	H	H	H	H	Me	H	Ph	H	H
17-116	Me	H	H	H	H	H	Me	H	H	Ph	H
17-117	Me	H	H	H	H	H	Me	H	H	H	Ph
17-118	Ph	H	H	H	H	H	Me	H	H	H	H
17-119	Ph	H	H	H	H	H	Me	Me	H	H	H
17-120	Ph	H	H	H	H	H	Me	H	Me	H	H
17-121	Ph	H	H	H	H	H	Me	H	H	Me	H
17-122	Ph	H	H	H	H	H	Me	H	H	H	Me
17-123	Ph	H	H	H	H	H	Me	Ph	H	H	H
17-124	Ph	H	H	H	H	H	Me	H	Ph	H	H
17-125	Ph	H	H	H	H	H	Me	H	H	Ph	H
17-126	Ph	H	H	H	H	H	Me	H	H	H	Ph
17-127	Me	Ph	H	H	H	H	H	H	H	H	H
17-128	Me	Ph	H	H	H	H	H	Me	H	H	H

TABLE 17-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4
17-129	Me	Ph	H	H	H	H	H	H	Me	H	H
17-130	Me	Ph	H	H	H	H	H	H	H	Me	H
17-131	Me	Ph	H	H	H	H	H	H	H	H	Me
17-132	Me	Ph	H	H	H	H	H	Ph	H	H	H
17-133	Me	Ph	H	H	H	H	H	H	Ph	H	H
17-134	Me	Ph	H	H	H	H	H	H	H	Ph	H
17-135	Me	Ph	H	H	H	H	H	H	H	H	Ph
17-136	Ph	Ph	H	H	H	H	H	H	H	H	H
17-137	Ph	Ph	H	H	H	H	H	Me	H	H	H
17-138	Ph	Ph	H	H	H	H	H	H	Me	H	H
17-139	Ph	Ph	H	H	H	H	H	H	H	Me	H
17-140	Ph	Ph	H	H	H	H	H	H	H	H	Me
17-141	Ph	Ph	H	H	H	H	H	Ph	H	H	H
17-142	Ph	Ph	H	H	H	H	H	H	Ph	H	H
17-143	Ph	Ph	H	H	H	H	H	H	H	Ph	H
17-144	Ph	Ph	H	H	H	H	H	H	H	H	Ph
17-145	Me	H	Ph	H	H	H	H	H	H	H	H
17-146	Me	H	Ph	H	H	H	H	Me	H	H	H
17-147	Me	H	Ph	H	H	H	H	H	Me	H	H
17-148	Me	H	Ph	H	H	H	H	H	H	Me	H
17-149	Me	H	Ph	H	H	H	H	H	H	H	Me
17-150	Me	H	Ph	H	H	H	H	Ph	H	H	H
17-151	Me	H	Ph	H	H	H	H	H	Ph	H	H
17-152	Me	H	Ph	H	H	H	H	H	H	Ph	H
17-153	Me	H	Ph	H	H	H	H	H	H	H	Ph
17-154	Ph	H	Ph	H	H	H	H	H	H	H	H
17-155	Ph	H	Ph	H	H	H	H	Me	H	H	H
17-156	Ph	H	Ph	H	H	H	H	H	Me	H	H
17-157	Ph	H	Ph	H	H	H	H	H	H	Me	H
17-158	Ph	H	Ph	H	H	H	H	H	H	H	Me
17-159	Ph	H	Ph	H	H	H	H	Ph	H	H	H
17-160	Ph	H	Ph	H	H	H	H	H	Ph	H	H
17-161	Ph	H	Ph	H	H	H	H	H	H	Ph	H
17-162	Ph	H	Ph	H	H	H	H	H	H	H	Ph
17-163	Me	H	H	Ph	H	H	H	H	H	H	H
17-164	Me	H	H	Ph	H	H	H	Me	H	H	H
17-165	Me	H	H	Ph	H	H	H	H	Me	H	H
17-166	Me	H	H	Ph	H	H	H	H	H	Me	H
17-167	Me	H	H	Ph	H	H	H	H	H	H	Me
17-168	Me	H	H	Ph	H	H	H	Ph	H	H	H
17-169	Me	H	H	Ph	H	H	H	H	Ph	H	H
17-170	Me	H	H	Ph	H	H	H	H	H	Ph	H
17-171	Me	H	H	Ph	H	H	H	H	H	H	Ph
17-172	Ph	H	H	Ph	H	H	H	H	H	H	H
17-173	Ph	H	H	Ph	H	H	H	Me	H	H	H
17-174	Ph	H	H	Ph	H	H	H	H	Me	H	H
17-175	Ph	H	H	Ph	H	H	H	H	H	Me	H
17-176	Ph	H	H	Ph	H	H	H	H	H	H	Me
17-177	Ph	H	H	Ph	H	H	H	Ph	H	H	H
17-178	Ph	H	H	Ph	H	H	H	H	Ph	H	H
17-179	Ph	H	H	Ph	H	H	H	H	H	Ph	H
17-180	Ph	H	H	Ph	H	H	H	H	H	H	Ph
17-181	Me	H	H	H	Ph	H	H	H	H	H	H
17-182	Me	H	H	H	Ph	H	H	Me	H	H	H
17-183	Me	H	H	H	Ph	H	H	H	Me	H	H
17-184	Me	H	H	H	Ph	H	H	H	H	Me	H
17-185	Me	H	H	H	Ph	H	H	H	H	H	Me
17-186	Me	H	H	H	Ph	H	H	Ph	H	H	H
17-187	Me	H	H	H	Ph	H	H	H	Ph	H	H
17-188	Me	H	H	H	Ph	H	H	H	H	Ph	H
17-189	Me	H	H	H	Ph	H	H	H	H	H	Ph
17-190	Ph	H	H	H	Ph	H	H	H	H	H	H
17-191	Ph	H	H	H	Ph	H	H	Me	H	H	H
17-192	Ph	H	H	H	Ph	H	H	H	Me	H	H
17-193	Ph	H	H	H	Ph	H	H	H	H	Me	H
17-194	Ph	H	H	H	Ph	H	H	H	H	H	Me
17-195	Ph	H	H	H	Ph	H	H	Ph	H	H	H
17-196	Ph	H	H	H	Ph	H	H	H	Ph	H	H
17-197	Ph	H	H	H	Ph	H	H	H	H	Ph	H
17-198	Ph	H	H	H	Ph	H	H	H	H	H	Ph
17-199	Me	H	H	H	H	Ph	H	H	H	H	H
17-200	Me	H	H	H	H	Ph	H	Me	H	H	H
17-201	Me	H	H	H	H	Ph	H	H	Me	H	H
17-202	Me	H	H	H	H	Ph	H	H	H	Me	H
17-203	Me	H	H	H	H	Ph	H	H	H	H	Me
17-204	Me	H	H	H	H	Ph	H	Ph	H	H	H
17-205	Me	H	H	H	H	Ph	H	H	Ph	H	H
17-206	Me	H	H	H	H	Ph	H	H	H	Ph	H

TABLE 17-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4
17-207	Me	H	H	H	H	Ph	H	H	H	H	Ph
17-208	Ph	H	H	H	H	Ph	H	H	H	H	H
17-209	Ph	H	H	H	H	Ph	H	Me	H	H	H
17-210	Ph	H	H	H	H	Ph	H	H	Me	H	H
17-211	Ph	H	H	H	H	Ph	H	H	H	Me	H
17-212	Ph	H	H	H	H	Ph	H	H	H	H	Me
17-213	Ph	H	H	H	H	Ph	H	Ph	H	H	H
17-214	Ph	H	H	H	H	Ph	H	H	Ph	H	H
17-215	Ph	H	H	H	H	Ph	H	H	H	Ph	H
17-216	Ph	H	H	H	H	Ph	H	H	H	H	Ph
17-217	Me	H	H	H	H	H	Ph	H	H	H	H
17-218	Me	H	H	H	H	H	Ph	Me	H	H	H
17-219	Me	H	H	H	H	H	Ph	H	Me	H	H
17-220	Me	H	H	H	H	H	Ph	H	H	Me	H
17-221	Me	H	H	H	H	H	Ph	H	H	H	Me
17-222	Me	H	H	H	H	H	Ph	Ph	H	H	H
17-223	Me	H	H	H	H	H	Ph	H	Ph	H	H
17-224	Me	H	H	H	H	H	Ph	H	H	Ph	H
17-225	Me	H	H	H	H	H	Ph	H	H	H	Ph
17-226	Ph	H	H	H	H	H	Ph	H	H	H	H
17-227	Ph	H	H	H	H	H	Ph	Me	H	H	H
17-228	Ph	H	H	H	H	H	Ph	H	Me	H	H
17-229	Ph	H	H	H	H	H	Ph	H	H	Me	H
17-230	Ph	H	H	H	H	H	Ph	H	H	H	Me
17-231	Ph	H	H	H	H	H	Ph	Ph	H	H	H
17-232	Ph	H	H	H	H	H	Ph	H	Ph	H	H
17-233	Ph	H	H	H	H	H	Ph	H	H	Ph	H
17-234	Ph	H	H	H	H	H	Ph	H	H	H	Ph

TABLE 18

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
18-1	Me	H	H	H	H	H	H	H	H	H	H	H	H
18-2	Me	H	H	H	H	H	H	Me	H	H	H	H	H
18-3	Me	H	H	H	H	H	H	H	Me	H	H	H	H
18-4	Me	H	H	H	H	H	H	H	H	Me	H	H	H
18-5	Me	H	H	H	H	H	H	H	H	H	Me	H	H
18-6	Me	H	H	H	H	H	H	H	H	H	H	Me	H
18-7	Me	H	H	H	H	H	H	H	H	H	H	H	Me
18-8	Me	H	H	H	H	H	H	Ph	H	H	H	H	H
18-9	Me	H	H	H	H	H	H	H	Ph	H	H	H	H
18-10	Me	H	H	H	H	H	H	H	H	Ph	H	H	H
18-11	Me	H	H	H	H	H	H	H	H	H	Ph	H	H
18-12	Me	H	H	H	H	H	H	H	H	H	H	Ph	H
18-13	Me	H	H	H	H	H	H	H	H	H	H	H	Ph
18-14	Ph	H	H	H	H	H	H	H	H	H	H	H	H
18-15	Ph	H	H	H	H	H	H	Me	H	H	H	H	H
18-16	Ph	H	H	H	H	H	H	H	Me	H	H	H	H
18-17	Ph	H	H	H	H	H	H	H	H	Me	H	H	H
18-18	Ph	H	H	H	H	H	H	H	H	H	Me	H	H
18-19	Ph	H	H	H	H	H	H	H	H	H	H	Me	H
18-20	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
18-21	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H
18-22	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H
18-23	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H
18-24	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H
18-25	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H
18-26	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph
18-27	Me	Me	H	H	H	H	H	H	H	H	H	H	H
18-28	Me	Me	H	H	H	H	H	Me	H	H	H	H	H
18-29	Me	Me	H	H	H	H	H	H	Me	H	H	H	H
18-30	Me	Me	H	H	H	H	H	H	H	Me	H	H	H
18-31	Me	Me	H	H	H	H	H	H	H	H	Me	H	H
18-32	Me	Me	H	H	H	H	H	H	H	H	H	Me	H
18-33	Me	Me	H	H	H	H	H	H	H	H	H	H	Me
18-34	Me	Me	H	H	H	H	H	Ph	H	H	H	H	H
18-35	Me	Me	H	H	H	H	H	H	Ph	H	H	H	H
18-36	Me	Me	H	H	H	H	H	H	H	Ph	H	H	H
18-37	Me	Me	H	H	H	H	H	H	H	H	Ph	H	H
18-38	Me	Me	H	H	H	H	H	H	H	H	H	Ph	H
18-39	Me	Me	H	H	H	H	H	H	H	H	H	H	Ph
18-40	Ph	Me	H	H	H	H	H	H	H	H	H	H	H
18-41	Ph	Me	H	H	H	H	H	Me	H	H	H	H	H
18-42	Ph	Me	H	H	H	H	H	H	Me	H	H	H	H

TABLE 18-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
18-43	Ph	Me	H	H	H	H	H	H	H	Me	H	H	H
18-44	Ph	Me	H	H	H	H	H	H	H	H	Me	H	H
18-45	Ph	Me	H	H	H	H	H	H	H	H	H	Me	H
18-46	Ph	Me	H	H	H	H	H	H	H	H	H	H	Me
18-47	Ph	Me	H	H	H	H	H	Ph	H	H	H	H	H
18-48	Ph	Me	H	H	H	H	H	H	Ph	H	H	H	H
18-49	Ph	Me	H	H	H	H	H	H	H	Ph	H	H	H
18-50	Ph	Me	H	H	H	H	H	H	H	H	Ph	H	H
18-51	Ph	Me	H	H	H	H	H	H	H	H	H	Ph	H
18-52	Ph	Me	H	H	H	H	H	H	H	H	H	H	Ph
18-53	Me	H	Me	H	H	H	H	H	H	H	H	H	H
18-54	Me	H	Me	H	H	H	H	Me	H	H	H	H	H
18-55	Me	H	Me	H	H	H	H	H	Me	H	H	H	H
18-56	Me	H	Me	H	H	H	H	H	H	Me	H	H	H
18-57	Me	H	Me	H	H	H	H	H	H	H	Me	H	H
18-58	Me	H	Me	H	H	H	H	H	H	H	H	Me	H
18-59	Me	H	Me	H	H	H	H	H	H	H	H	H	Me
18-60	Me	H	Me	H	H	H	H	Ph	H	H	H	H	H
18-61	Me	H	Me	H	H	H	H	H	Ph	H	H	H	H
18-62	Me	H	Me	H	H	H	H	H	H	Ph	H	H	H
18-63	Me	H	Me	H	H	H	H	H	H	H	Ph	H	H
18-64	Me	H	Me	H	H	H	H	H	H	H	H	Ph	H
18-65	Me	H	Me	H	H	H	H	H	H	H	H	H	Ph
18-66	Ph	H	Me	H	H	H	H	H	H	H	H	H	H
18-67	Ph	H	Me	H	H	H	H	Me	H	H	H	H	H
18-68	Ph	H	Me	H	H	H	H	H	Me	H	H	H	H
18-69	Ph	H	Me	H	H	H	H	H	H	Me	H	H	H
18-70	Ph	H	Me	H	H	H	H	H	H	H	Me	H	H
18-71	Ph	H	Me	H	H	H	H	H	H	H	H	Me	H
18-72	Ph	H	Me	H	H	H	H	H	H	H	H	H	Me
18-73	Ph	H	Me	H	H	H	H	Ph	H	H	H	H	H
18-74	Ph	H	Me	H	H	H	H	H	Ph	H	H	H	H
18-75	Ph	H	Me	H	H	H	H	H	H	Ph	H	H	H
18-76	Ph	H	Me	H	H	H	H	H	H	H	Ph	H	H
18-77	Ph	H	Me	H	H	H	H	H	H	H	H	Ph	H
18-78	Ph	H	Me	H	H	H	H	H	H	H	H	H	Ph
18-79	Me	H	H	Me	H	H	H	H	H	H	H	H	H
18-80	Me	H	H	Me	H	H	H	Me	H	H	H	H	H
18-81	Me	H	H	Me	H	H	H	H	Me	H	H	H	H
18-82	Me	H	H	Me	H	H	H	H	H	Me	H	H	H
18-83	Me	H	H	Me	H	H	H	H	H	H	Me	H	H
18-84	Me	H	H	Me	H	H	H	H	H	H	H	Me	H
18-85	Me	H	H	Me	H	H	H	H	H	H	H	H	Me
18-86	Me	H	H	Me	H	H	H	Ph	H	H	H	H	H
18-87	Me	H	H	Me	H	H	H	H	Ph	H	H	H	H
18-88	Me	H	H	Me	H	H	H	H	H	Ph	H	H	H
18-89	Me	H	H	Me	H	H	H	H	H	H	Ph	H	H
18-90	Me	H	H	Me	H	H	H	H	H	H	H	Ph	H
18-91	Me	H	H	Me	H	H	H	H	H	H	H	H	Ph
18-92	Ph	H	H	Me	H	H	H	H	H	H	H	H	H
18-93	Ph	H	H	Me	H	H	H	Me	H	H	H	H	H
18-94	Ph	H	H	Me	H	H	H	H	Me	H	H	H	H
18-95	Ph	H	H	Me	H	H	H	H	H	Me	H	H	H
18-96	Ph	H	H	Me	H	H	H	H	H	H	Me	H	H
18-97	Ph	H	H	Me	H	H	H	H	H	H	H	Me	H
18-98	Ph	H	H	Me	H	H	H	H	H	H	H	H	Me
18-99	Ph	H	H	Me	H	H	H	Ph	H	H	H	H	H
18-100	Ph	H	H	Me	H	H	H	H	Ph	H	H	H	H
18-101	Ph	H	H	Me	H	H	H	H	H	Ph	H	H	H
18-102	Ph	H	H	Me	H	H	H	H	H	H	Ph	H	H
18-103	Ph	H	H	Me	H	H	H	H	H	H	H	Ph	H
18-104	Ph	H	H	Me	H	H	H	H	H	H	H	H	Ph
18-105	Me	H	H	H	Me	H	H	H	H	H	H	H	H
18-106	Me	H	H	H	Me	H	H	Me	H	H	H	H	H
18-107	Me	H	H	H	Me	H	H	H	Me	H	H	H	H
18-108	Me	H	H	H	Me	H	H	H	H	Me	H	H	H
18-109	Me	H	H	H	Me	H	H	H	H	H	Me	H	H
18-110	Me	H	H	H	Me	H	H	H	H	H	H	Me	H
18-111	Me	H	H	H	Me	H	H	H	H	H	H	H	Me
18-112	Me	H	H	H	Me	H	H	Ph	H	H	H	H	H
18-113	Me	H	H	H	Me	H	H	H	Ph	H	H	H	H
18-114	Me	H	H	H	Me	H	H	H	H	Ph	H	H	H
18-115	Me	H	H	H	Me	H	H	H	H	H	Ph	H	H
18-116	Me	H	H	H	Me	H	H	H	H	H	H	Ph	H
18-117	Me	H	H	H	Me	H	H	H	H	H	H	H	Ph
18-118	Ph	H	H	H	Me	H	H	H	H	H	H	H	H
18-119	Ph	H	H	H	Me	H	H	Me	H	H	H	H	H
18-120	Ph	H	H	H	Me	H	H	H	Me	H	H	H	H

TABLE 18-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
18-121	Ph	H	H	H	Me	H	H	H	H	Me	H	H	H
18-122	Ph	H	H	H	Me	H	H	H	H	H	Me	H	H
18-123	Ph	H	H	H	Me	H	H	H	H	H	H	Me	H
18-124	Ph	H	H	H	Me	H	H	H	H	H	H	H	Me
18-125	Ph	H	H	H	Me	H	H	Ph	H	H	H	H	H
18-126	Ph	H	H	H	Me	H	H	H	Ph	H	H	H	H
18-127	Ph	H	H	H	Me	H	H	H	H	Ph	H	H	H
18-128	Ph	H	H	H	Me	H	H	H	H	H	Ph	H	H
18-129	Ph	H	H	H	Me	H	H	H	H	H	H	Ph	H
18-130	Ph	H	H	H	Me	H	H	H	H	H	H	H	Ph
18-131	Me	H	H	H	H	Me	H	H	H	H	H	H	H
18-132	Me	H	H	H	H	Me	H	Me	H	H	H	H	H
18-133	Me	H	H	H	H	Me	H	H	Me	H	H	H	H
18-134	Me	H	H	H	H	Me	H	H	H	Me	H	H	H
18-135	Me	H	H	H	H	Me	H	H	H	H	Me	H	H
18-136	Me	H	H	H	H	Me	H	H	H	H	H	Me	H
18-137	Me	H	H	H	H	Me	H	H	H	H	H	H	Me
18-138	Me	H	H	H	H	Me	H	Ph	H	H	H	H	H
18-139	Me	H	H	H	H	Me	H	H	Ph	H	H	H	H
18-140	Me	H	H	H	H	Me	H	H	H	Ph	H	H	H
18-141	Me	H	H	H	H	Me	H	H	H	H	Ph	H	H
18-142	Me	H	H	H	H	Me	H	H	H	H	H	Ph	H
18-143	Me	H	H	H	H	Me	H	H	H	H	H	H	Ph
18-144	Ph	H	H	H	H	Me	H	H	H	H	H	H	H
18-145	Ph	H	H	H	H	Me	H	Me	H	H	H	H	H
18-146	Ph	H	H	H	H	Me	H	H	Me	H	H	H	H
18-147	Ph	H	H	H	H	Me	H	H	H	Me	H	H	H
18-148	Ph	H	H	H	H	Me	H	H	H	H	Me	H	H
18-149	Ph	H	H	H	H	Me	H	H	H	H	H	Me	H
18-150	Ph	H	H	H	H	Me	H	H	H	H	H	H	Me
18-151	Ph	H	H	H	H	Me	H	Ph	H	H	H	H	H
18-152	Ph	H	H	H	H	Me	H	H	Ph	H	H	H	H
18-153	Ph	H	H	H	H	Me	H	H	H	Ph	H	H	H
18-154	Ph	H	H	H	H	Me	H	H	H	H	Ph	H	H
18-155	Ph	H	H	H	H	Me	H	H	H	H	H	Ph	H
18-156	Ph	H	H	H	H	Me	H	H	H	H	H	H	Ph
18-157	Me	H	H	H	H	H	Me	H	H	H	H	H	H
18-158	Me	H	H	H	H	H	Me	Me	H	H	H	H	H
18-159	Me	H	H	H	H	H	Me	H	Me	H	H	H	H
18-160	Me	H	H	H	H	H	Me	H	H	Me	H	H	H
18-161	Me	H	H	H	H	H	Me	H	H	H	Me	H	H
18-162	Me	H	H	H	H	H	Me	H	H	H	H	Me	H
18-163	Me	H	H	H	H	H	Me	H	H	H	H	H	Me
18-164	Me	H	H	H	H	H	Me	Ph	H	H	H	H	H
18-165	Me	H	H	H	H	H	Me	H	Ph	H	H	H	H
18-166	Me	H	H	H	H	H	Me	H	H	Ph	H	H	H
18-167	Me	H	H	H	H	H	Me	H	H	H	Ph	H	H
18-168	Me	H	H	H	H	H	Me	H	H	H	H	Ph	H
18-169	Me	H	H	H	H	H	Me	H	H	H	H	H	Ph
18-170	Ph	H	H	H	H	H	Me	H	H	H	H	H	H
18-171	Ph	H	H	H	H	H	Me	Me	H	H	H	H	H
18-172	Ph	H	H	H	H	H	Me	H	Me	H	H	H	H
18-173	Ph	H	H	H	H	H	Me	H	H	Me	H	H	H
18-174	Ph	H	H	H	H	H	Me	H	H	H	Me	H	H
18-175	Ph	H	H	H	H	H	Me	H	H	H	H	Me	H
18-176	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me
18-177	Ph	H	H	H	H	H	Me	Ph	H	H	H	H	H
18-178	Ph	H	H	H	H	H	Me	H	Ph	H	H	H	H
18-179	Ph	H	H	H	H	H	Me	H	H	Ph	H	H	H
18-180	Ph	H	H	H	H	H	Me	H	H	H	Ph	H	H
18-181	Ph	H	H	H	H	H	Me	H	H	H	H	Ph	H
18-182	Ph	H	H	H	H	H	Me	H	H	H	H	H	Ph
18-183	Me	Ph	H	H	H	H	H	H	H	H	H	H	H
18-184	Me	Ph	H	H	H	H	H	Me	H	H	H	H	H
18-185	Me	Ph	H	H	H	H	H	H	Me	H	H	H	H
18-186	Me	Ph	H	H	H	H	H	H	H	Me	H	H	H
18-187	Me	Ph	H	H	H	H	H	H	H	H	Me	H	H
18-188	Me	Ph	H	H	H	H	H	H	H	H	H	Me	H
18-189	Me	Ph	H	H	H	H	H	H	H	H	H	H	Me
18-190	Me	Ph	H	H	H	H	H	Ph	H	H	H	H	H
18-191	Me	Ph	H	H	H	H	H	H	Ph	H	H	H	H
18-192	Me	Ph	H	H	H	H	H	H	H	Ph	H	H	H
18-193	Me	Ph	H	H	H	H	H	H	H	H	Ph	H	H
18-194	Me	Ph	H	H	H	H	H	H	H	H	H	Ph	H
18-195	Me	Ph	H	H	H	H	H	H	H	H	H	H	Ph
18-196	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H
18-197	Ph	Ph	H	H	H	H	H	Me	H	H	H	H	H
18-198	Ph	Ph	H	H	H	H	H	H	Me	H	H	H	H

TABLE 18-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
18-199	Ph	Ph	H	H	H	H	H	H	H	Me	H	H	H
18-200	Ph	Ph	H	H	H	H	H	H	H	H	Me	H	H
18-201	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	H
18-202	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Me
18-203	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H	H
18-204	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H	H
18-205	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H	H
18-206	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H	H
18-207	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph	H
18-208	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Ph
18-209	Me	H	Ph	H	H	H	H	H	H	H	H	H	H
18-210	Me	H	Ph	H	H	H	H	Me	H	H	H	H	H
18-211	Me	H	Ph	H	H	H	H	H	Me	H	H	H	H
18-212	Me	H	Ph	H	H	H	H	H	H	Me	H	H	H
18-213	Me	H	Ph	H	H	H	H	H	H	H	Me	H	H
18-214	Me	H	Ph	H	H	H	H	H	H	H	H	Me	H
18-215	Me	H	Ph	H	H	H	H	H	H	H	H	H	Me
18-216	Me	H	Ph	H	H	H	H	Ph	H	H	H	H	H
18-217	Me	H	Ph	H	H	H	H	H	Ph	H	H	H	H
18-218	Me	H	Ph	H	H	H	H	H	H	Ph	H	H	H
18-219	Me	H	Ph	H	H	H	H	H	H	H	Ph	H	H
18-22O	Me	H	Ph	H	H	H	H	H	H	H	H	Ph	H
18-221	Me	H	Ph	H	H	H	H	H	H	H	H	H	Ph
18-222	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H
18-223	Ph	H	Ph	H	H	H	H	Me	H	H	H	H	H
18-224	Ph	H	Ph	H	H	H	H	H	Me	H	H	H	H
18-225	Ph	H	Ph	H	H	H	H	H	H	Me	H	H	H
18-226	Ph	H	Ph	H	H	H	H	H	H	H	Me	H	H
18-227	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	H
18-228	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Me
18-229	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H	H
18-230	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H	H
18-231	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H	H
18-232	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H	H
18-233	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph	H
18-234	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Ph
18-235	Me	H	H	Ph	H	H	H	H	H	H	H	H	H
18-236	Me	H	H	Ph	H	H	H	Me	H	H	H	H	H
18-237	Me	H	H	Ph	H	H	H	H	Me	H	H	H	H
18-238	Me	H	H	Ph	H	H	H	H	H	Me	H	H	H
18-239	Me	H	H	Ph	H	H	H	H	H	H	Me	H	H
18-240	Me	H	H	Ph	H	H	H	H	H	H	H	Me	H
18-241	Me	H	H	Ph	H	H	H	H	H	H	H	H	Me
18-242	Me	H	H	Ph	H	H	H	Ph	H	H	H	H	H
18-243	Me	H	H	Ph	H	H	H	H	Ph	H	H	H	H
18-244	Me	H	H	Ph	H	H	H	H	H	Ph	H	H	H
18-245	Me	H	H	Ph	H	H	H	H	H	H	Ph	H	H
18-246	Me	H	H	Ph	H	H	H	H	H	H	H	Ph	H
18-247	Me	H	H	Ph	H	H	H	H	H	H	H	H	Ph
18-248	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H
18-249	Ph	H	H	Ph	H	H	H	Me	H	H	H	H	H
18-250	Ph	H	H	Ph	H	H	H	H	Me	H	H	H	H
18-251	Ph	H	H	Ph	H	H	H	H	H	Me	H	H	H
18-252	Ph	H	H	Ph	H	H	H	H	H	H	Me	H	H
18-253	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	H
18-254	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Me
18-255	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H	H
18-256	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H	H
18-257	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H	H
18-258	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H	H
18-259	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph	H
18-260	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Ph
18-261	Me	H	H	H	Ph	H	H	H	H	H	H	H	H
18-262	Me	H	H	H	Ph	H	H	Me	H	H	H	H	H
18-263	Me	H	H	H	Ph	H	H	H	Me	H	H	H	H
18-264	Me	H	H	H	Ph	H	H	H	H	Me	H	H	H
18-265	Me	H	H	H	Ph	H	H	H	H	H	Me	H	H
18-266	Me	H	H	H	Ph	H	H	H	H	H	H	Me	H
18-267	Me	H	H	H	Ph	H	H	H	H	H	H	H	Me
18-268	Me	H	H	H	Ph	H	H	Ph	H	H	H	H	H
18-269	Me	H	H	H	Ph	H	H	H	Ph	H	H	H	H
18-270	Me	H	H	H	Ph	H	H	H	H	Ph	H	H	H
18-271	Me	H	H	H	Ph	H	H	H	H	H	Ph	H	H
18-272	Me	H	H	H	Ph	H	H	H	H	H	H	Ph	H
18-273	Me	H	H	H	Ph	H	H	H	H	H	H	H	Ph
18-274	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H
18-275	Ph	H	H	H	Ph	H	H	Me	H	H	H	H	H
18-276	Ph	H	H	H	Ph	H	H	H	Me	H	H	H	H

TABLE 18-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
18-277	Ph	H	H	H	Ph	H	H	H	H	Me	H	H	H
18-278	Ph	H	H	H	Ph	H	H	H	H	H	Me	H	H
18-279	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	H
18-280	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Me
18-281	Ph	H	H	H	Ph	H	H	Ph	H	H	H	H	H
18-282	Ph	H	H	H	Ph	H	H	H	Ph	H	H	H	H
18-283	Ph	H	H	H	Ph	H	H	H	H	Ph	H	H	H
18-284	Ph	H	H	H	Ph	H	H	H	H	H	Ph	H	H
18-285	Ph	H	H	H	Ph	H	H	H	H	H	H	Ph	H
18-286	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Ph
18-287	Me	H	H	H	H	Ph	H	H	H	H	H	H	H
18-288	Me	H	H	H	H	Ph	H	Me	H	H	H	H	H
18-289	Me	H	H	H	H	Ph	H	H	Me	H	H	H	H
18-290	Me	H	H	H	H	Ph	H	H	H	Me	H	H	H
18-291	Me	H	H	H	H	Ph	H	H	H	H	Me	H	H
18-292	Me	H	H	H	H	Ph	H	H	H	H	H	Me	H
18-293	Me	H	H	H	H	Ph	H	H	H	H	H	H	Me
18-294	Me	H	H	H	H	Ph	H	Ph	H	H	H	H	H
18-295	Me	H	H	H	H	Ph	H	H	Ph	H	H	H	H
18-296	Me	H	H	H	H	Ph	H	H	H	Ph	H	H	H
18-297	Me	H	H	H	H	Ph	H	H	H	H	Ph	H	H
18-298	Me	H	H	H	H	Ph	H	H	H	H	H	Ph	H
18-299	Me	H	H	H	H	Ph	H	H	H	H	H	H	Ph
18-300	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H
18-301	Ph	H	H	H	H	Ph	H	Me	H	H	H	H	H
18-302	Ph	H	H	H	H	Ph	H	H	Me	H	H	H	H
18-303	Ph	H	H	H	H	Ph	H	H	H	Me	H	H	H
18-304	Ph	H	H	H	H	Ph	H	H	H	H	Me	H	H
18-305	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	H
18-306	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Me
18-307	Ph	H	H	H	H	Ph	H	Ph	H	H	H	H	H
18-308	Ph	H	H	H	H	Ph	H	H	Ph	H	H	H	H
18-309	Ph	H	H	H	H	Ph	H	H	H	Ph	H	H	H
18-310	Ph	H	H	H	H	Ph	H	H	H	H	Ph	H	H
18-311	Ph	H	H	H	H	Ph	H	H	H	H	H	Ph	H
18-312	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Ph
18-313	Me	H	H	H	H	H	Ph	H	H	H	H	H	H
18-314	Me	H	H	H	H	H	Ph	Me	H	H	H	H	H
18-315	Me	H	H	H	H	H	Ph	H	Me	H	H	H	H
18-316	Me	H	H	H	H	H	Ph	H	H	Me	H	H	H
18-317	Me	H	H	H	H	H	Ph	H	H	H	Me	H	H
18-318	Me	H	H	H	H	H	Ph	H	H	H	H	Me	H
18-319	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me
18-320	Me	H	H	H	H	H	Ph	Ph	H	H	H	H	H
18-321	Me	H	H	H	H	H	Ph	H	Ph	H	H	H	H
18-322	Me	H	H	H	H	H	Ph	H	H	Ph	H	H	H
18-323	Me	H	H	H	H	H	Ph	H	H	H	Ph	H	H
18-324	Me	H	H	H	H	H	Ph	H	H	H	H	Ph	H
18-325	Me	H	H	H	H	H	Ph	H	H	H	H	H	Ph
18-326	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H
18-327	Ph	H	H	H	H	H	Ph	Me	H	H	H	H	H
18-328	Ph	H	H	H	H	H	Ph	H	Me	H	H	H	H
18-329	Ph	H	H	H	H	H	Ph	H	H	Me	H	H	H
18-330	Ph	H	H	H	H	H	Ph	H	H	H	Me	H	H
18-331	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	H
18-332	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me
18-333	Ph	H	H	H	H	H	Ph	Ph	H	H	H	H	H
18-334	Ph	H	H	H	H	H	Ph	H	Ph	H	H	H	H
18-335	Ph	H	H	H	H	H	Ph	H	H	Ph	H	H	H
18-336	Ph	H	H	H	H	H	Ph	H	H	H	Ph	H	H
18-337	Ph	H	H	H	H	H	Ph	H	H	H	H	Ph	H
18-338	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Ph

TABLE 19

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 1	Me	H	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 2	Me	H	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 3	Me	H	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 4	Me	H	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 5	Me	H	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 6	Me	H	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 7	Me	H	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 8	Me	H	H	H	H	H	H	Ph	H	H	H	H	H	Me

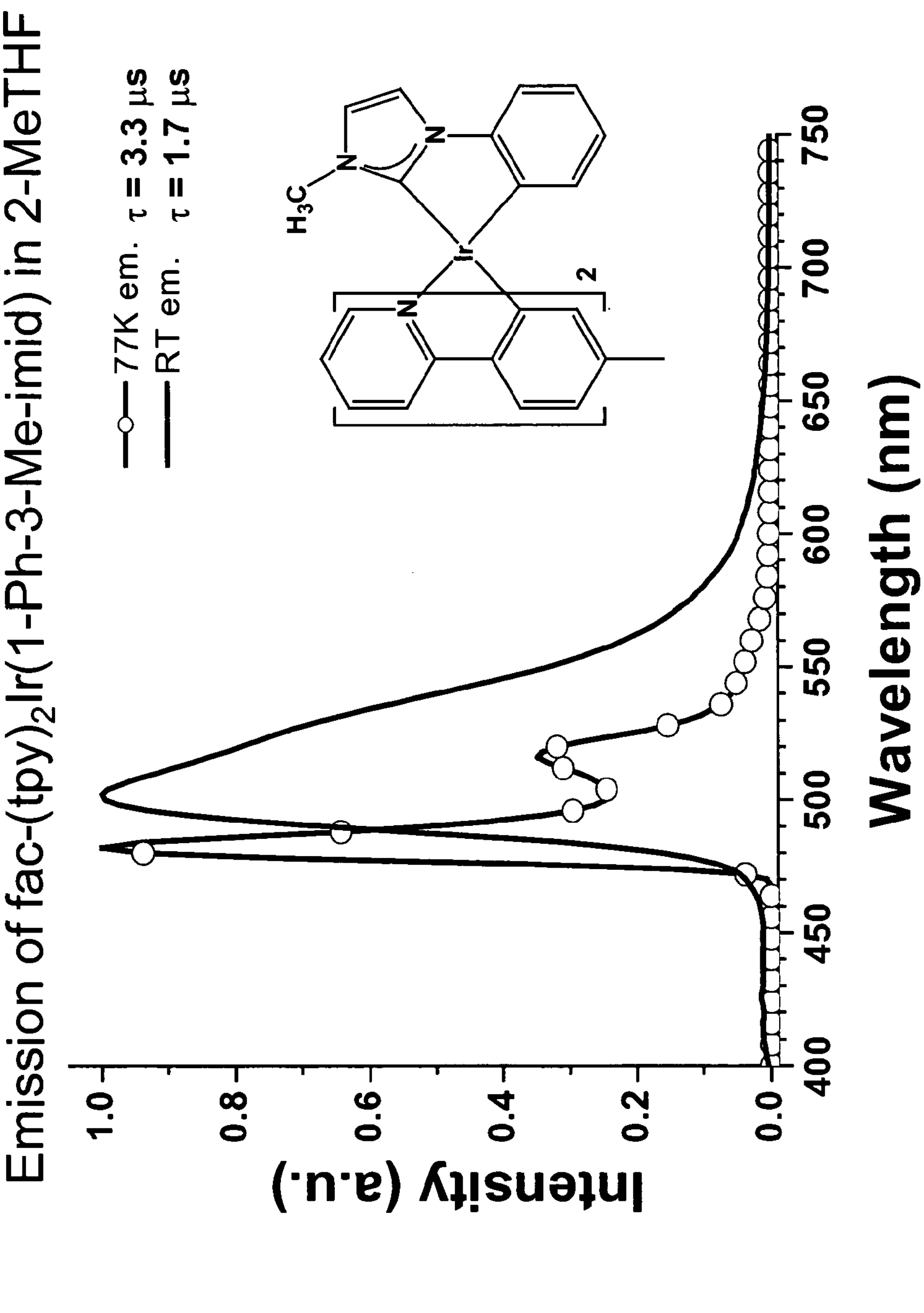

Emission of fac-(tpy)$_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF
77K em. τ = 3.3 μs
RT em. τ = 1.7 μs
H$_3$C
N
N
Ir
N
2
Intensity (a.u.)
1.0
0.8
0.6
0.4
0.2
0.0
400
450
500
550
600
650
700
750
Wavelength (nm)

Figure 10

TABLE 19-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 9	Me	H	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 10	Me	H	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 11	Me	H	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 12	Me	H	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 13	Me	H	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 14	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 15	Ph	H	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 16	Ph	H	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 17	Ph	H	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 18	Ph	H	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 19	Ph	H	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 20	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 21	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 22	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 23	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 24	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 25	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 26	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 27	Me	Me	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 28	Me	Me	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 29	Me	Me	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 30	Me	Me	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 31	Me	Me	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 32	Me	Me	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 33	Me	Me	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 34	Me	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 35	Me	Me	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 36	Me	Me	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 37	Me	Me	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 38	Me	Me	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 39	Me	Me	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 40	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 41	Ph	Me	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 42	Ph	Me	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 43	Ph	Me	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 44	Ph	Me	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 45	Ph	Me	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 46	Ph	Me	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 47	Ph	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 48	Ph	Me	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 49	Ph	Me	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 50	Ph	Me	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 51	Ph	Me	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 52	Ph	Me	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 53	Me	H	Me	H	H	H	H	H	H	H	H	H	H	Me
19-1 54	Me	H	Me	H	H	H	H	Me	H	H	H	H	H	Me
19-1 55	Me	H	Me	H	H	H	H	H	Me	H	H	H	H	Me
19-1 56	Me	H	Me	H	H	H	H	H	H	Me	H	H	H	Me
19-1 57	Me	H	Me	H	H	H	H	H	H	H	Me	H	H	Me
19-1 58	Me	H	Me	H	H	H	H	H	H	H	H	Me	H	Me
19-1 59	Me	H	Me	H	H	H	H	H	H	H	H	H	Me	Me
19-1 60	Me	H	Me	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 61	Me	H	Me	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 62	Me	H	Me	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 63	Me	H	Me	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 64	Me	H	Me	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 65	Me	H	Me	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 66	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	Me
19-1 67	Ph	H	Me	H	H	H	H	Me	H	H	H	H	H	Me
19-1 68	Ph	H	Me	H	H	H	H	H	Me	H	H	H	H	Me
19-1 69	Ph	H	Me	H	H	H	H	H	H	Me	H	H	H	Me
19-1 70	Ph	H	Me	H	H	H	H	H	H	H	Me	H	H	Me
19-1 71	Ph	H	Me	H	H	H	H	H	H	H	H	Me	H	Me
19-1 72	Ph	H	Me	H	H	H	H	H	H	H	H	H	Me	Me
19-1 73	Ph	H	Me	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 74	Ph	H	Me	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 75	Ph	H	Me	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 76	Ph	H	Me	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 77	Ph	H	Me	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 78	Ph	H	Me	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 79	Me	H	H	Me	H	H	H	H	H	H	H	H	H	Me
19-1 80	Me	H	H	Me	H	H	H	Me	H	H	H	H	H	Me
19-1 81	Me	H	H	Me	H	H	H	H	Me	H	H	H	H	Me
19-1 82	Me	H	H	Me	H	H	H	H	H	Me	H	H	H	Me
19-1 83	Me	H	H	Me	H	H	H	H	H	H	Me	H	H	Me
19-1 84	Me	H	H	Me	H	H	H	H	H	H	H	Me	H	Me
19-1 85	Me	H	H	Me	H	H	H	H	H	H	H	H	Me	Me
19-1 86	Me	H	H	Me	H	H	H	Ph	H	H	H	H	H	Me

TABLE 19-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 87	Me	H	H	Me	H	H	H	H	Ph	H	H	H	H	Me
19-1 88	Me	H	H	Me	H	H	H	H	H	Ph	H	H	H	Me
19-1 89	Me	H	H	Me	H	H	H	H	H	H	Ph	H	H	Me
19-1 90	Me	H	H	Me	H	H	H	H	H	H	H	Ph	H	Me
19-1 91	Me	H	H	Me	H	H	H	H	H	H	H	H	Ph	Me
19-1 92	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	Me
19-1 93	Ph	H	H	Me	H	H	H	Me	H	H	H	H	H	Me
19-1 94	Ph	H	H	Me	H	H	H	H	Me	H	H	H	H	Me
19-1 95	Ph	H	H	Me	H	H	H	H	H	Me	H	H	H	Me
19-1 96	Ph	H	H	Me	H	H	H	H	H	H	Me	H	H	Me
19-1 97	Ph	H	H	Me	H	H	H	H	H	H	H	Me	H	Me
19-1 98	Ph	H	H	Me	H	H	H	H	H	H	H	H	Me	Me
19-1 99	Ph	H	H	Me	H	H	H	Ph	H	H	H	H	H	Me
19-1 100	Ph	H	H	Me	H	H	H	H	Ph	H	H	H	H	Me
19-1 101	Ph	H	H	Me	H	H	H	H	H	Ph	H	H	H	Me
19-1 102	Ph	H	H	Me	H	H	H	H	H	H	Ph	H	H	Me
19-1 103	Ph	H	H	Me	H	H	H	H	H	H	H	Ph	H	Me
19-1 104	Ph	H	H	Me	H	H	H	H	H	H	H	H	Ph	Me
19-1 105	Me	H	H	H	Me	H	H	H	H	H	H	H	H	Me
19-1 106	Me	H	H	H	Me	H	H	Me	H	H	H	H	H	Me
19-1 107	Me	H	H	H	Me	H	H	H	Me	H	H	H	H	Me
19-1 108	Me	H	H	H	Me	H	H	H	H	Me	H	H	H	Me
19-1 109	Me	H	H	H	Me	H	H	H	H	H	Me	H	H	Me
19-1 110	Me	H	H	H	Me	H	H	H	H	H	H	Me	H	Me
19-1 111	Me	H	H	H	Me	H	H	H	H	H	H	H	Me	Me
19-1 112	Me	H	H	H	Me	H	H	Ph	H	H	H	H	H	Me
19-1 113	Me	H	H	H	Me	H	H	H	Ph	H	H	H	H	Me
19-1 114	Me	H	H	H	Me	H	H	H	H	Ph	H	H	H	Me
19-1 115	Me	H	H	H	Me	H	H	H	H	H	Ph	H	H	Me
19-1 116	Me	H	H	H	Me	H	H	H	H	H	H	Ph	H	Me
19-1 117	Me	H	H	H	Me	H	H	H	H	H	H	H	Ph	Me
19-1 118	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	Me
19-1 119	Ph	H	H	H	Me	H	H	Me	H	H	H	H	H	Me
19-1 120	Ph	H	H	H	Me	H	H	H	Me	H	H	H	H	Me
19-1 121	Ph	H	H	H	Me	H	H	H	H	Me	H	H	H	Me
19-1 122	Ph	H	H	H	Me	H	H	H	H	H	Me	H	H	Me
19-1 123	Ph	H	H	H	Me	H	H	H	H	H	H	Me	H	Me
19-1 124	Ph	H	H	H	Me	H	H	H	H	H	H	H	Me	Me
19-1 125	Ph	H	H	H	Me	H	H	Ph	H	H	H	H	H	Me
19-1 126	Ph	H	H	H	Me	H	H	H	Ph	H	H	H	H	Me
19-1 127	Ph	H	H	H	Me	H	H	H	H	Ph	H	H	H	Me
19-1 128	Ph	H	H	H	Me	H	H	H	H	H	Ph	H	H	Me
19-1 129	Ph	H	H	H	Me	H	H	H	H	H	H	Ph	H	Me
19-1 130	Ph	H	H	H	Me	H	H	H	H	H	H	H	Ph	Me
19-1 131	Me	H	H	H	H	Me	H	H	H	H	H	H	H	Me
19-1 132	Me	H	H	H	H	Me	H	Me	H	H	H	H	H	Me
19-1 133	Me	H	H	H	H	Me	H	H	Me	H	H	H	H	Me
19-1 134	Me	H	H	H	H	Me	H	H	H	Me	H	H	H	Me
19-1 135	Me	H	H	H	H	Me	H	H	H	H	Me	H	H	Me
19-1 136	Me	H	H	H	H	Me	H	H	H	H	H	Me	H	Me
19-1 137	Me	H	H	H	H	Me	H	H	H	H	H	H	Me	Me
19-1 138	Me	H	H	H	H	Me	H	Ph	H	H	H	H	H	Me
19-1 139	Me	H	H	H	H	Me	H	H	Ph	H	H	H	H	Me
19-1 140	Me	H	H	H	H	Me	H	H	H	Ph	H	H	H	Me
19-1 141	Me	H	H	H	H	Me	H	H	H	H	Ph	H	H	Me
19-1 142	Me	H	H	H	H	Me	H	H	H	H	H	Ph	H	Me
19-1 143	Me	H	H	H	H	Me	H	H	H	H	H	H	Ph	Me
19-1 144	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	Me
19-1 145	Ph	H	H	H	H	Me	H	Me	H	H	H	H	H	Me
19-1 146	Ph	H	H	H	H	Me	H	H	Me	H	H	H	H	Me
19-1 147	Ph	H	H	H	H	Me	H	H	H	Me	H	H	H	Me
19-1 148	Ph	H	H	H	H	Me	H	H	H	H	Me	H	H	Me
19-1 149	Ph	H	H	H	H	Me	H	H	H	H	H	Me	H	Me
19-1 150	Ph	H	H	H	H	Me	H	H	H	H	H	H	Me	Me
19-1 151	Ph	H	H	H	H	Me	H	Ph	H	H	H	H	H	Me
19-1 152	Ph	H	H	H	H	Me	H	H	Ph	H	H	H	H	Me
19-1 153	Ph	H	H	H	H	Me	H	H	H	Ph	H	H	H	Me
19-1 154	Ph	H	H	H	H	Me	H	H	H	H	Ph	H	H	Me
19-1 155	Ph	H	H	H	H	Me	H	H	H	H	H	Ph	H	Me
19-1 156	Ph	H	H	H	H	Me	H	H	H	H	H	H	Ph	Me
19-1 157	Me	H	H	H	H	H	Me	H	H	H	H	H	H	Me
19-1 158	Me	H	H	H	H	H	Me	Me	H	H	H	H	H	Me
19-1 159	Me	H	H	H	H	H	Me	H	Me	H	H	H	H	Me
19-1 160	Me	H	H	H	H	H	Me	H	H	Me	H	H	H	Me
19-1 161	Me	H	H	H	H	H	Me	H	H	H	Me	H	H	Me
19-1 162	Me	H	H	H	H	H	Me	H	H	H	H	Me	H	Me
19-1 163	Me	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
19-1 164	Me	H	H	H	H	H	Me	Ph	H	H	H	H	H	Me

TABLE 19-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 165	Me	H	H	H	H	H	Me	H	Ph	H	H	H	H	Me
19-1 166	Me	H	H	H	H	H	Me	H	H	Ph	H	H	H	Me
19-1 167	Me	H	H	H	H	H	Me	H	H	H	Ph	H	H	Me
19-1 168	Me	H	H	H	H	H	Me	H	H	H	H	Ph	H	Me
19-1 169	Me	H	H	H	H	H	Me	H	H	H	H	H	Ph	Me
19-1 170	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	Me
19-1 171	Ph	H	H	H	H	H	Me	Me	H	H	H	H	H	Me
19-1 172	Ph	H	H	H	H	H	Me	H	Me	H	H	H	H	Me
19-1 173	Ph	H	H	H	H	H	Me	H	H	Me	H	H	H	Me
19-1 174	Ph	H	H	H	H	H	Me	H	H	H	Me	H	H	Me
19-1 175	Ph	H	H	H	H	H	Me	H	H	H	H	Me	H	Me
19-1 176	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
19-1 177	Ph	H	H	H	H	H	Me	Ph	H	H	H	H	H	Me
19-1 178	Ph	H	H	H	H	H	Me	H	Ph	H	H	H	H	Me
19-1 179	Ph	H	H	H	H	H	Me	H	H	Ph	H	H	H	Me
19-1 180	Ph	H	H	H	H	H	Me	H	H	H	Ph	H	H	Me
19-1 181	Ph	H	H	H	H	H	Me	H	H	H	H	Ph	H	Me
19-1 182	Ph	H	H	H	H	H	Me	H	H	H	H	H	Ph	Me
19-1 183	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 184	Me	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 185	Me	Ph	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 186	Me	Ph	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 187	Me	Ph	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 188	Me	Ph	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 189	Me	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 190	Me	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 191	Me	Ph	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 192	Me	Ph	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 193	Me	Ph	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 194	Me	Ph	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 195	Me	Ph	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 196	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
19-1 197	Ph	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me
19-1 198	Ph	Ph	H	H	H	H	H	H	Me	H	H	H	H	Me
19-1 199	Ph	Ph	H	H	H	H	H	H	H	Me	H	H	H	Me
19-1 200	Ph	Ph	H	H	H	H	H	H	H	H	Me	H	H	Me
19-1 201	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	H	Me
19-1 202	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me
19-1 203	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 204	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 205	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 206	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 207	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 208	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 209	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	Me
19-1 210	Me	H	Ph	H	H	H	H	Me	H	H	H	H	H	Me
19-1 211	Me	H	Ph	H	H	H	H	H	Me	H	H	H	H	Me
19-1 212	Me	H	Ph	H	H	H	H	H	H	Me	H	H	H	Me
19-1 213	Me	H	Ph	H	H	H	H	H	H	H	Me	H	H	Me
19-1 214	Me	H	Ph	H	H	H	H	H	H	H	H	Me	H	Me
19-1 215	Me	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me
19-1 216	Me	H	Ph	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 217	Me	H	Ph	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 218	Me	H	Ph	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 219	Me	H	Ph	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 220	Me	H	Ph	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 221	Me	H	Ph	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 222	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	Me
19-1 223	Ph	H	Ph	H	H	H	H	Me	H	H	H	H	H	Me
19-1 224	Ph	H	Ph	H	H	H	H	H	Me	H	H	H	H	Me
19-1 225	Ph	H	Ph	H	H	H	H	H	H	Me	H	H	H	Me
19-1 226	Ph	H	Ph	H	H	H	H	H	H	H	Me	H	H	Me
19-1 227	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	H	Me
19-1 228	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me
19-1 229	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H	H	Me
19-1 230	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H	H	Me
19-1 231	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H	H	Me
19-1 232	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H	H	Me
19-1 233	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph	H	Me
19-1 234	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Ph	Me
19-1 235	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	Me
19-1 236	Me	H	H	Ph	H	H	H	Me	H	H	H	H	H	Me
19-1 237	Me	H	H	Ph	H	H	H	H	Me	H	H	H	H	Me
19-1 238	Me	H	H	Ph	H	H	H	H	H	Me	H	H	H	Me
19-1 239	Me	H	H	Ph	H	H	H	H	H	H	Me	H	H	Me
19-1 240	Me	H	H	Ph	H	H	H	H	H	H	H	Me	H	Me
19-1 241	Me	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me
19-1 242	Me	H	H	Ph	H	H	H	Ph	H	H	H	H	H	Me

TABLE 19-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 243	Me	H	H	Ph	H	H	H	H	Ph	H	H	H	H	Me
19-1 244	Me	H	H	Ph	H	H	H	H	H	Ph	H	H	H	Me
19-1 245	Me	H	H	Ph	H	H	H	H	H	H	Ph	H	H	Me
19-1 246	Me	H	H	Ph	H	H	H	H	H	H	H	Ph	H	Me
19-1 247	Me	H	H	Ph	H	H	H	H	H	H	H	H	Ph	Me
19-1 248	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	Me
19-1 249	Ph	H	H	Ph	H	H	H	Me	H	H	H	H	H	Me
19-1 250	Ph	H	H	Ph	H	H	H	H	Me	H	H	H	H	Me
19-1 251	Ph	H	H	Ph	H	H	H	H	H	Me	H	H	H	Me
19-1 252	Ph	H	H	Ph	H	H	H	H	H	H	Me	H	H	Me
19-1 253	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	H	Me
19-1 254	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me
19-1 255	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H	H	Me
19-1 256	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H	H	Me
19-1 257	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H	H	Me
19-1 258	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H	H	Me
19-1 259	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph	H	Me
19-1 260	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Ph	Me
19-1 261	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	Me
19-1 262	Me	H	H	H	Ph	H	H	Me	H	H	H	H	H	Me
19-1 263	Me	H	H	H	Ph	H	H	H	Me	H	H	H	H	Me
19-1 264	Me	H	H	H	Ph	H	H	H	H	Me	H	H	H	Me
19-1 265	Me	H	H	H	Ph	H	H	H	H	H	Me	H	H	Me
19-1 266	Me	H	H	H	Ph	H	H	H	H	H	H	Me	H	Me
19-1 267	Me	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me
19-1 268	Me	H	H	H	Ph	H	H	Ph	H	H	H	H	H	Me
19-1 269	Me	H	H	H	Ph	H	H	H	Ph	H	H	H	H	Me
19-1 270	Me	H	H	H	Ph	H	H	H	H	Ph	H	H	H	Me
19-1 271	Me	H	H	H	Ph	H	H	H	H	H	Ph	H	H	Me
19-1 272	Me	H	H	H	Ph	H	H	H	H	H	H	Ph	H	Me
19-1 273	Me	H	H	H	Ph	H	H	H	H	H	H	H	Ph	Me
19-1 274	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	Me
19-1 275	Ph	H	H	H	Ph	H	H	Me	H	H	H	H	H	Me
19-1 276	Ph	H	H	H	Ph	H	H	H	Me	H	H	H	H	Me
19-1 277	Ph	H	H	H	Ph	H	H	H	H	Me	H	H	H	Me
19-1 278	Ph	H	H	H	Ph	H	H	H	H	H	Me	H	H	Me
19-1 279	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	H	Me
19-1 280	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me
19-1 281	Ph	H	H	H	Ph	H	H	Ph	H	H	H	H	H	Me
19-1 282	Ph	H	H	H	Ph	H	H	H	Ph	H	H	H	H	Me
19-1 283	Ph	H	H	H	Ph	H	H	H	H	Ph	H	H	H	Me
19-1 284	Ph	H	H	H	Ph	H	H	H	H	H	Ph	H	H	Me
19-1 285	Ph	H	H	H	Ph	H	H	H	H	H	H	Ph	H	Me
19-1 286	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Ph	Me
19-1 287	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	Me
19-1 288	Me	H	H	H	H	Ph	H	Me	H	H	H	H	H	Me
19-1 289	Me	H	H	H	H	Ph	H	H	Me	H	H	H	H	Me
19-1 290	Me	H	H	H	H	Ph	H	H	H	Me	H	H	H	Me
19-1 291	Me	H	H	H	H	Ph	H	H	H	H	Me	H	H	Me
19-1 292	Me	H	H	H	H	Ph	H	H	H	H	H	Me	H	Me
19-1 293	Me	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me
19-1 294	Me	H	H	H	H	Ph	H	Ph	H	H	H	H	H	Me
19-1 295	Me	H	H	H	H	Ph	H	H	Ph	H	H	H	H	Me
19-1 296	Me	H	H	H	H	Ph	H	H	H	Ph	H	H	H	Me
19-1 297	Me	H	H	H	H	Ph	H	H	H	H	Ph	H	H	Me
19-1 298	Me	H	H	H	H	Ph	H	H	H	H	H	Ph	H	Me
19-1 299	Me	H	H	H	H	Ph	H	H	H	H	H	H	Ph	Me
19-1 300	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	Me
19-1 301	Ph	H	H	H	H	Ph	H	Me	H	H	H	H	H	Me
19-1 302	Ph	H	H	H	H	Ph	H	H	Me	H	H	H	H	Me
19-1 303	Ph	H	H	H	H	Ph	H	H	H	Me	H	H	H	Me
19-1 304	Ph	H	H	H	H	Ph	H	H	H	H	Me	H	H	Me
19-1 305	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	H	Me
19-1 306	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me
19-1 307	Ph	H	H	H	H	Ph	H	Ph	H	H	H	H	H	Me
19-1 308	Ph	H	H	H	H	Ph	H	H	Ph	H	H	H	H	Me
19-1 309	Ph	H	H	H	H	Ph	H	H	H	Ph	H	H	H	Me
19-1 310	Ph	H	H	H	H	Ph	H	H	H	H	Ph	H	H	Me
19-1 311	Ph	H	H	H	H	Ph	H	H	H	H	H	Ph	H	Me
19-1 312	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Ph	Me
19-1 313	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	Me
19-1 314	Me	H	H	H	H	H	Ph	Me	H	H	H	H	H	Me
19-1 315	Me	H	H	H	H	H	Ph	H	Me	H	H	H	H	Me
19-1 316	Me	H	H	H	H	H	Ph	H	H	Me	H	H	H	Me
19-1 317	Me	H	H	H	H	H	Ph	H	H	H	Me	H	H	Me
19-1 318	Me	H	H	H	H	H	Ph	H	H	H	H	Me	H	Me
19-1 319	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
19-1 320	Me	H	H	H	H	H	Ph	Ph	H	H	H	H	H	Me

TABLE 19-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
19-1 321	Me	H	H	H	H	H	Ph	H	Ph	H	H	H	H	Me
19-1 322	Me	H	H	H	H	H	Ph	H	H	Ph	H	H	H	Me
19-1 323	Me	H	H	H	H	H	Ph	H	H	H	Ph	H	H	Me
19-1 324	Me	H	H	H	H	H	Ph	H	H	H	H	Ph	H	Me
19-1 325	Me	H	H	H	H	H	Ph	H	H	H	H	H	Ph	Me
19-1 326	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	Me
19-1 327	Ph	H	H	H	H	H	Ph	Me	H	H	H	H	H	Me
19-1 328	Ph	H	H	H	H	H	Ph	H	Me	H	H	H	H	Me
19-1 329	Ph	H	H	H	H	H	Ph	H	H	Me	H	H	H	Me
19-1 330	Ph	H	H	H	H	H	Ph	H	H	H	Me	H	H	Me
19-1 331	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	H	Me
19-1 332	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
19-1 333	Ph	H	H	H	H	H	Ph	Ph	H	H	H	H	H	Me
19-1 334	Ph	H	H	H	H	H	Ph	H	Ph	H	H	H	H	Me
19-1 335	Ph	H	H	H	H	H	Ph	H	H	Ph	H	H	H	Me
19-1 336	Ph	H	H	H	H	H	Ph	H	H	H	Ph	H	H	Me
19-1 337	Ph	H	H	H	H	H	Ph	H	H	H	H	Ph	H	Me
19-1 338	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Ph	Me

TABLE 20

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-1	Me	H	H	H	H	H	H	H	H	H	H	H	H	H	H
20-2	Me	H	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-3	Me	H	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-4	Me	H	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-5	Me	H	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-6	Me	H	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-7	Me	H	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-8	Me	H	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-9	Me	H	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-10	Me	H	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-11	Me	H	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-12	Me	H	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-13	Me	H	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-14	Me	H	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-15	Me	H	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-16	Me	H	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-17	Me	H	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-18	Ph	H	H	H	H	H	H	H	H	H	H	H	H	H	H
20-19	Ph	H	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-20	Ph	H	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-21	Ph	H	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-22	Ph	H	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-23	Ph	H	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-24	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-25	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-26	Ph	H	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-27	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-28	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-29	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-30	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-31	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-32	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-33	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-34	Ph	H	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-35	Me	Me	H	H	H	H	H	H	H	H	H	H	H	H	H
20-36	Me	Me	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-37	Me	Me	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-38	Me	Me	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-39	Me	Me	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-40	Me	Me	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-41	Me	Me	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-42	Me	Me	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-43	Me	Me	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-44	Me	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-45	Me	Me	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-46	Me	Me	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-47	Me	Me	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-48	Me	Me	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-49	Me	Me	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-50	Me	Me	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-51	Me	Me	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-52	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	H	H

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-53	Ph	Me	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-54	Ph	Me	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-55	Ph	Me	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-56	Ph	Me	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-57	Ph	Me	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-58	Ph	Me	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-59	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-60	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-61	Ph	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-62	Ph	Me	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-63	Ph	Me	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-64	Ph	Me	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-65	Ph	Me	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-66	Ph	Me	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-67	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-68	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-69	Me	H	Me	H	H	H	H	H	H	H	H	H	H	H	H
20-70	Me	H	Me	H	H	H	H	Me	H	H	H	H	H	H	H
20-71	Me	H	Me	H	H	H	H	H	Me	H	H	H	H	H	H
20-72	Me	H	Me	H	H	H	H	H	H	Me	H	H	H	H	H
20-73	Me	H	Me	H	H	H	H	H	H	H	Me	H	H	H	H
20-74	Me	H	Me	H	H	H	H	H	H	H	H	Me	H	H	H
20-75	Me	H	Me	H	H	H	H	H	H	H	H	H	Me	H	H
20-76	Me	H	Me	H	H	H	H	H	H	H	H	H	H	Me	H
20-77	Me	H	Me	H	H	H	H	H	H	H	H	H	H	H	Me
20-78	Me	H	Me	H	H	H	H	Ph	H	H	H	H	H	H	H
20-79	Me	H	Me	H	H	H	H	H	Ph	H	H	H	H	H	H
20-80	Me	H	Me	H	H	H	H	H	H	Ph	H	H	H	H	H
20-81	Me	H	Me	H	H	H	H	H	H	H	Ph	H	H	H	H
20-82	Me	H	Me	H	H	H	H	H	H	H	H	Ph	H	H	H
20-83	Me	H	Me	H	H	H	H	H	H	H	H	H	Ph	H	H
20-84	Me	H	Me	H	H	H	H	H	H	H	H	H	H	Ph	H
20-85	Me	H	Me	H	H	H	H	H	H	H	H	H	H	H	Ph
20-86	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	H	H
20-87	Ph	H	Me	H	H	H	H	Me	H	H	H	H	H	H	H
20-88	Ph	H	Me	H	H	H	H	H	Me	H	H	H	H	H	H
20-89	Ph	H	Me	H	H	H	H	H	H	Me	H	H	H	H	H
20-90	Ph	H	Me	H	H	H	H	H	H	H	Me	H	H	H	H
20-91	Ph	H	Me	H	H	H	H	H	H	H	H	Me	H	H	H
20-92	Ph	H	Me	H	H	H	H	H	H	H	H	H	Me	H	H
20-93	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	Me	H
20-94	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	H	Me
20-95	Ph	H	Me	H	H	H	H	Ph	H	H	H	H	H	H	H
20-96	Ph	H	Me	H	H	H	H	H	Ph	H	H	H	H	H	H
20-97	Ph	H	Me	H	H	H	H	H	H	Ph	H	H	H	H	H
20-98	Ph	H	Me	H	H	H	H	H	H	H	Ph	H	H	H	H
20-99	Ph	H	Me	H	H	H	H	H	H	H	H	Ph	H	H	H
20-100	Ph	H	Me	H	H	H	H	H	H	H	H	H	Ph	H	H
20-101	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	Ph	H
20-102	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	H	Ph
20-103	Me	H	H	Me	H	H	H	H	H	H	H	H	H	H	H
20-104	Me	H	H	Me	H	H	H	Me	H	H	H	H	H	H	H
20-105	Me	H	H	Me	H	H	H	H	Me	H	H	H	H	H	H
20-106	Me	H	H	Me	H	H	H	H	H	Me	H	H	H	H	H
20-107	Me	H	H	Me	H	H	H	H	H	H	Me	H	H	H	H
20-108	Me	H	H	Me	H	H	H	H	H	H	H	Me	H	H	H
20-109	Me	H	H	Me	H	H	H	H	H	H	H	H	Me	H	H
20-110	Me	H	H	Me	H	H	H	H	H	H	H	H	H	Me	H
20-111	Me	H	H	Me	H	H	H	H	H	H	H	H	H	H	Me
20-112	Me	H	H	Me	H	H	H	Ph	H	H	H	H	H	H	H
20-113	Me	H	H	Me	H	H	H	H	Ph	H	H	H	H	H	H
20-114	Me	H	H	Me	H	H	H	H	H	Ph	H	H	H	H	H
20-115	Me	H	H	Me	H	H	H	H	H	H	Ph	H	H	H	H
20-116	Me	H	H	Me	H	H	H	H	H	H	H	Ph	H	H	H
20-117	Me	H	H	Me	H	H	H	H	H	H	H	H	Ph	H	H
20-118	Me	H	H	Me	H	H	H	H	H	H	H	H	H	Ph	H
20-119	Me	H	H	Me	H	H	H	H	H	H	H	H	H	H	Ph
20-120	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	H	H
20-121	Ph	H	H	Me	H	H	H	Me	H	H	H	H	H	H	H
20-122	Ph	H	H	Me	H	H	H	H	Me	H	H	H	H	H	H
20-123	Ph	H	H	Me	H	H	H	H	H	Me	H	H	H	H	H
20-124	Ph	H	H	Me	H	H	H	H	H	H	Me	H	H	H	H
20-125	Ph	H	H	Me	H	H	H	H	H	H	H	Me	H	H	H
20-126	Ph	H	H	Me	H	H	H	H	H	H	H	H	Me	H	H
20-127	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	Me	H
20-128	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	H	Me
20-129	Ph	H	H	Me	H	H	H	Ph	H	H	H	H	H	H	H
20-130	Ph	H	H	Me	H	H	H	H	Ph	H	H	H	H	H	H

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-131	Ph	H	H	Me	H	H	H	H	H	Ph	H	H	H	H	H
20-132	Ph	H	H	Me	H	H	H	H	H	H	Ph	H	H	H	H
20-133	Ph	H	H	Me	H	H	H	H	H	H	H	Ph	H	H	H
20-134	Ph	H	H	Me	H	H	H	H	H	H	H	H	Ph	H	H
20-135	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	Ph	H
20-136	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	H	Ph
20-137	Me	H	H	H	Me	H	H	H	H	H	H	H	H	H	H
20-138	Me	H	H	H	Me	H	H	Me	H	H	H	H	H	H	H
20-139	Me	H	H	H	Me	H	H	H	Me	H	H	H	H	H	H
20-140	Me	H	H	H	Me	H	H	H	H	Me	H	H	H	H	H
20-141	Me	H	H	H	Me	H	H	H	H	H	Me	H	H	H	H
20-142	Me	H	H	H	Me	H	H	H	H	H	H	Me	H	H	H
20-143	Me	H	H	H	Me	H	H	H	H	H	H	H	Me	H	H
20-144	Me	H	H	H	Me	H	H	H	H	H	H	H	H	Me	H
20-145	Me	H	H	H	Me	H	H	H	H	H	H	H	H	H	Me
20-146	Me	H	H	H	Me	H	H	Ph	H	H	H	H	H	H	H
20-147	Me	H	H	H	Me	H	H	H	Ph	H	H	H	H	H	H
20-148	Me	H	H	H	Me	H	H	H	H	Ph	H	H	H	H	H
20-149	Me	H	H	H	Me	H	H	H	H	H	Ph	H	H	H	H
20-150	Me	H	H	H	Me	H	H	H	H	H	H	Ph	H	H	H
20-151	Me	H	H	H	Me	H	H	H	H	H	H	H	Ph	H	H
20-152	Me	H	H	H	Me	H	H	H	H	H	H	H	H	Ph	H
20-153	Me	H	H	H	Me	H	H	H	H	H	H	H	H	H	Ph
20-154	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	H	H
20-155	Ph	H	H	H	Me	H	H	Me	H	H	H	H	H	H	H
20-156	Ph	H	H	H	Me	H	H	H	Me	H	H	H	H	H	H
20-157	Ph	H	H	H	Me	H	H	H	H	Me	H	H	H	H	H
20-158	Ph	H	H	H	Me	H	H	H	H	H	Me	H	H	H	H
20-159	Ph	H	H	H	Me	H	H	H	H	H	H	Me	H	H	H
20-160	Ph	H	H	H	Me	H	H	H	H	H	H	H	Me	H	H
20-161	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	Me	H
20-162	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	H	Me
20-163	Ph	H	H	H	Me	H	H	Ph	H	H	H	H	H	H	H
20-164	Ph	H	H	H	Me	H	H	H	Ph	H	H	H	H	H	H
20-165	Ph	H	H	H	Me	H	H	H	H	Ph	H	H	H	H	H
20-166	Ph	H	H	H	Me	H	H	H	H	H	Ph	H	H	H	H
20-167	Ph	H	H	H	Me	H	H	H	H	H	H	Ph	H	H	H
20-168	Ph	H	H	H	Me	H	H	H	H	H	H	H	Ph	H	H
20-169	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	Ph	H
20-170	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	H	Ph
20-171	Me	H	H	H	H	Me	H	H	H	H	H	H	H	H	H
20-172	Me	H	H	H	H	Me	H	Me	H	H	H	H	H	H	H
20-173	Me	H	H	H	H	Me	H	H	Me	H	H	H	H	H	H
20-174	Me	H	H	H	H	Me	H	H	H	Me	H	H	H	H	H
20-175	Me	H	H	H	H	Me	H	H	H	H	Me	H	H	H	H
20-176	Me	H	H	H	H	Me	H	H	H	H	H	Me	H	H	H
20-177	Me	H	H	H	H	Me	H	H	H	H	H	H	Me	H	H
20-178	Me	H	H	H	H	Me	H	H	H	H	H	H	H	Me	H
20-179	Me	H	H	H	H	Me	H	H	H	H	H	H	H	H	Me
20-180	Me	H	H	H	H	Me	H	Ph	H	H	H	H	H	H	H
20-181	Me	H	H	H	H	Me	H	H	Ph	H	H	H	H	H	H
20-182	Me	H	H	H	H	Me	H	H	H	Ph	H	H	H	H	H
20-183	Me	H	H	H	H	Me	H	H	H	H	Ph	H	H	H	H
20-184	Me	H	H	H	H	Me	H	H	H	H	H	Ph	H	H	H
20-185	Me	H	H	H	H	Me	H	H	H	H	H	H	Ph	H	H
20-186	Me	H	H	H	H	Me	H	H	H	H	H	H	H	Ph	H
20-187	Me	H	H	H	H	Me	H	H	H	H	H	H	H	H	Ph
20-188	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	H	H
20-189	Ph	H	H	H	H	Me	H	Me	H	H	H	H	H	H	H
20-190	Ph	H	H	H	H	Me	H	H	Me	H	H	H	H	H	H
20-191	Ph	H	H	H	H	Me	H	H	H	Me	H	H	H	H	H
20-192	Ph	H	H	H	H	Me	H	H	H	H	Me	H	H	H	H
20-193	Ph	H	H	H	H	Me	H	H	H	H	H	Me	H	H	H
20-194	Ph	H	H	H	H	Me	H	H	H	H	H	H	Me	H	H
20-195	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	Me	H
20-196	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	H	Me
20-197	Ph	H	H	H	H	Me	H	Ph	H	H	H	H	H	H	H
20-198	Ph	H	H	H	H	Me	H	H	Ph	H	H	H	H	H	H
20-199	Ph	H	H	H	H	Me	H	H	H	Ph	H	H	H	H	H
20-200	Ph	H	H	H	H	Me	H	H	H	H	Ph	H	H	H	H
20-201	Ph	H	H	H	H	Me	H	H	H	H	H	Ph	H	H	H
20-202	Ph	H	H	H	H	Me	H	H	H	H	H	H	Ph	H	H
20-203	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	Ph	H
20-204	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	H	Ph
20-205	Me	H	H	H	H	H	Me	H	H	H	H	H	H	H	H
20-206	Me	H	H	H	H	H	Me	Me	H	H	H	H	H	H	H
20-207	Me	H	H	H	H	H	Me	H	Me	H	H	H	H	H	H
20-208	Me	H	H	H	H	H	Me	H	H	Me	H	H	H	H	H

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-209	Me	H	H	H	H	H	Me	H	H	H	Me	H	H	H	H
20-210	Me	H	H	H	H	H	Me	H	H	H	H	Me	H	H	H
20-211	Me	H	H	H	H	H	Me	H	H	H	H	H	Me	H	H
20-212	Me	H	H	H	H	H	Me	H	H	H	H	H	H	Me	H
20-213	Me	H	H	H	H	H	Me	H	H	H	H	H	H	H	Me
20-214	Me	H	H	H	H	H	Me	Ph	H	H	H	H	H	H	H
20-215	Me	H	H	H	H	H	Me	H	Ph	H	H	H	H	H	H
20-216	Me	H	H	H	H	H	Me	H	H	Ph	H	H	H	H	H
20-217	Me	H	H	H	H	H	Me	H	H	H	Ph	H	H	H	H
20-218	Me	H	H	H	H	H	Me	H	H	H	H	Ph	H	H	H
20-219	Me	H	H	H	H	H	Me	H	H	H	H	H	Ph	H	H
20-220	Me	H	H	H	H	H	Me	H	H	H	H	H	H	Ph	H
20-221	Me	H	H	H	H	H	Me	H	H	H	H	H	H	H	Ph
20-222	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	H	H
20-223	Ph	H	H	H	H	H	Me	Me	H	H	H	H	H	H	H
20-224	Ph	H	H	H	H	H	Me	H	Me	H	H	H	H	H	H
20-225	Ph	H	H	H	H	H	Me	H	H	Me	H	H	H	H	H
20-226	Ph	H	H	H	H	H	Me	H	H	H	Me	H	H	H	H
20-227	Ph	H	H	H	H	H	Me	H	H	H	H	Me	H	H	H
20-228	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me	H	H
20-229	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	Me	H
20-230	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	H	Me
20-231	Ph	H	H	H	H	H	Me	Ph	H	H	H	H	H	H	H
20-232	Ph	H	H	H	H	H	Me	H	Ph	H	H	H	H	H	H
20-233	Ph	H	H	H	H	H	Me	H	H	Ph	H	H	H	H	H
20-234	Ph	H	H	H	H	H	Me	H	H	H	Ph	H	H	H	H
20-235	Ph	H	H	H	H	H	Me	H	H	H	H	Ph	H	H	H
20-236	Ph	H	H	H	H	H	Me	H	H	H	H	H	Ph	H	H
20-237	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	Ph	H
20-238	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	H	Ph
20-239	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	H	H
20-240	Me	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-241	Me	Ph	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-242	Me	Ph	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-243	Me	Ph	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-244	Me	Ph	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-245	Me	Ph	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-246	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-247	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-248	Me	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-249	Me	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-250	Me	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-251	Me	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-252	Me	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-253	Me	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-254	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-255	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-256	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	H	H
20-257	Ph	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	H
20-258	Ph	Ph	H	H	H	H	H	H	Me	H	H	H	H	H	H
20-259	Ph	Ph	H	H	H	H	H	H	H	Me	H	H	H	H	H
20-260	Ph	Ph	H	H	H	H	H	H	H	H	Me	H	H	H	H
20-261	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	H	H	H
20-262	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Me	H	H
20-263	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	H
20-264	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Me
20-265	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	H
20-266	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H	H
20-267	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H	H
20-268	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H	H
20-269	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H	H
20-270	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H	H
20-271	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph	H
20-272	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Ph
20-273	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	H	H
20-274	Me	H	Ph	H	H	H	H	Me	H	H	H	H	H	H	H
20-275	Me	H	Ph	H	H	H	H	H	Me	H	H	H	H	H	H
20-276	Me	H	Ph	H	H	H	H	H	H	Me	H	H	H	H	H
20-277	Me	H	Ph	H	H	H	H	H	H	H	Me	H	H	H	H
20-278	Me	H	Ph	H	H	H	H	H	H	H	H	Me	H	H	H
20-279	Me	H	Ph	H	H	H	H	H	H	H	H	H	Me	H	H
20-280	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	Me	H
20-281	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
20-282	Me	H	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H
20-283	Me	H	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H
20-284	Me	H	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H
20-285	Me	H	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H
20-286	Me	H	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-287	Me	H	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H
20-288	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H
20-289	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph
20-290	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	H	H
20-291	Ph	H	Ph	H	H	H	H	Me	H	H	H	H	H	H	H
20-292	Ph	H	Ph	H	H	H	H	H	Me	H	H	H	H	H	H
20-293	Ph	H	Ph	H	H	H	H	H	H	Me	H	H	H	H	H
20-294	Ph	H	Ph	H	H	H	H	H	H	H	Me	H	H	H	H
20-295	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	H	H	H
20-296	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Me	H	H
20-297	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	Me	H
20-298	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
20-299	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H
20-300	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H
20-301	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H
20-302	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H
20-303	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H
20-304	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H
20-305	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H
20-306	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph
20-307	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	H	H
20-308	Me	H	H	Ph	H	H	H	Me	H	H	H	H	H	H	H
20-309	Me	H	H	Ph	H	H	H	H	Me	H	H	H	H	H	H
20-310	Me	H	H	Ph	H	H	H	H	H	Me	H	H	H	H	H
20-311	Me	H	H	Ph	H	H	H	H	H	H	Me	H	H	H	H
20-312	Me	H	H	Ph	H	H	H	H	H	H	H	Me	H	H	H
20-313	Me	H	H	Ph	H	H	H	H	H	H	H	H	Me	H	H
20-314	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	Me	H
20-315	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	H	Me
20-316	Me	H	H	Ph	H	H	H	Ph	H	H	H	H	H	H	H
20-317	Me	H	H	Ph	H	H	H	H	Ph	H	H	H	H	H	H
20-318	Me	H	H	Ph	H	H	H	H	H	Ph	H	H	H	H	H
20-319	Me	H	H	Ph	H	H	H	H	H	H	Ph	H	H	H	H
20-320	Me	H	H	Ph	H	H	H	H	H	H	H	Ph	H	H	H
20-321	Me	H	H	Ph	H	H	H	H	H	H	H	H	Ph	H	H
20-322	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	Ph	H
20-323	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	H	Ph
20-324	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	H	H
20-325	Ph	H	H	Ph	H	H	H	Me	H	H	H	H	H	H	H
20-326	Ph	H	H	Ph	H	H	H	H	Me	H	H	H	H	H	H
20-327	Ph	H	H	Ph	H	H	H	H	H	Me	H	H	H	H	H
20-328	Ph	H	H	Ph	H	H	H	H	H	H	Me	H	H	H	H
20-329	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	H	H	H
20-330	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Me	H	H
20-331	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	Me	H
20-332	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	H	Me
20-333	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H	H	H	H
20-334	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H	H	H	H
20-335	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H	H	H	H
20-336	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H	H	H	H
20-337	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph	H	H	H
20-338	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Ph	H	H
20-339	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	Ph	H
20-340	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	H	Ph
20-341	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	H	H
20-342	Me	H	H	H	Ph	H	H	Me	H	H	H	H	H	H	H
20-343	Me	H	H	H	Ph	H	H	H	Me	H	H	H	H	H	H
20-344	Me	H	H	H	Ph	H	H	H	H	Me	H	H	H	H	H
20-345	Me	H	H	H	Ph	H	H	H	H	H	Me	H	H	H	H
20-346	Me	H	H	H	Ph	H	H	H	H	H	H	Me	H	H	H
20-347	Me	H	H	H	Ph	H	H	H	H	H	H	H	Me	H	H
20-348	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	Me	H
20-349	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	H	Me
20-350	Me	H	H	H	Ph	H	H	Ph	H	H	H	H	H	H	H
20-351	Me	H	H	H	Ph	H	H	H	Ph	H	H	H	H	H	H
20-352	Me	H	H	H	Ph	H	H	H	H	Ph	H	H	H	H	H
20-353	Me	H	H	H	Ph	H	H	H	H	H	Ph	H	H	H	H
20-354	Me	H	H	H	Ph	H	H	H	H	H	H	Ph	H	H	H
20-355	Me	H	H	H	Ph	H	H	H	H	H	H	H	Ph	H	H
20-356	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	Ph	H
20-357	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	H	Ph
20-358	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	H	H
20-359	Ph	H	H	H	Ph	H	H	Me	H	H	H	H	H	H	H
20-360	Ph	H	H	H	Ph	H	H	H	Me	H	H	H	H	H	H
20-361	Ph	H	H	H	Ph	H	H	H	H	Me	H	H	H	H	H
20-362	Ph	H	H	H	Ph	H	H	H	H	H	Me	H	H	H	H
20-363	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	H	H	H
20-364	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Me	H	H

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-365	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	Me	H
20-366	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	H	Me
20-367	Ph	H	H	H	Ph	H	H	Ph	H	H	H	H	H	H	H
20-368	Ph	H	H	H	Ph	H	H	H	Ph	H	H	H	H	H	H
20-369	Ph	H	H	H	Ph	H	H	H	H	Ph	H	H	H	H	H
20-370	Ph	H	H	H	Ph	H	H	H	H	H	Ph	H	H	H	H
20-371	Ph	H	H	H	Ph	H	H	H	H	H	H	Ph	H	H	H
20-372	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Ph	H	H
20-373	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	Ph	H
20-374	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	H	Ph
20-375	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	H	H
20-376	Me	H	H	H	H	Ph	H	Me	H	H	H	H	H	H	H
20-377	Me	H	H	H	H	Ph	H	H	Me	H	H	H	H	H	H
20-378	Me	H	H	H	H	Ph	H	H	H	Me	H	H	H	H	H
20-379	Me	H	H	H	H	Ph	H	H	H	H	Me	H	H	H	H
20-380	Me	H	H	H	H	Ph	H	H	H	H	H	Me	H	H	H
20-381	Me	H	H	H	H	Ph	H	H	H	H	H	H	Me	H	H
20-382	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	Me	H
20-383	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	H	Me
20-384	Me	H	H	H	H	Ph	H	Ph	H	H	H	H	H	H	H
20-385	Me	H	H	H	H	Ph	H	H	Ph	H	H	H	H	H	H
20-386	Me	H	H	H	H	Ph	H	H	H	Ph	H	H	H	H	H
20-387	Me	H	H	H	H	Ph	H	H	H	H	Ph	H	H	H	H
20-388	Me	H	H	H	H	Ph	H	H	H	H	H	Ph	H	H	H
20-389	Me	H	H	H	H	Ph	H	H	H	H	H	H	Ph	H	H
20-390	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	Ph	H
20-391	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	H	Ph
20-392	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	H	H
20-393	Ph	H	H	H	H	Ph	H	Me	H	H	H	H	H	H	H
20-394	Ph	H	H	H	H	Ph	H	H	Me	H	H	H	H	H	H
20-395	Ph	H	H	H	H	Ph	H	H	H	Me	H	H	H	H	H
20-396	Ph	H	H	H	H	Ph	H	H	H	H	Me	H	H	H	H
20-397	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	H	H	H
20-398	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Me	H	H
20-399	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	Me	H
20-400	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	H	Me
20-401	Ph	H	H	H	H	Ph	H	Ph	H	H	H	H	H	H	H
20-402	Ph	H	H	H	H	Ph	H	H	Ph	H	H	H	H	H	H
20-403	Ph	H	H	H	H	Ph	H	H	H	Ph	H	H	H	H	H
20-404	Ph	H	H	H	H	Ph	H	H	H	H	Ph	H	H	H	H
20-405	Ph	H	H	H	H	Ph	H	H	H	H	H	Ph	H	H	H
20-406	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Ph	H	H
20-407	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	Ph	H
20-408	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	H	Ph
20-409	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	H	H
20-410	Me	H	H	H	H	H	Ph	Me	H	H	H	H	H	H	H
20-411	Me	H	H	H	H	H	Ph	H	Me	H	H	H	H	H	H
20-412	Me	H	H	H	H	H	Ph	H	H	Me	H	H	H	H	H
20-413	Me	H	H	H	H	H	Ph	H	H	H	Me	H	H	H	H
20-414	Me	H	H	H	H	H	Ph	H	H	H	H	Me	H	H	H
20-415	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me	H	H
20-416	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	Me	H
20-417	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	H	Me
20-418	Me	H	H	H	H	H	Ph	Ph	H	H	H	H	H	H	H
20-419	Me	H	H	H	H	H	Ph	H	Ph	H	H	H	H	H	H
20-420	Me	H	H	H	H	H	Ph	H	H	Ph	H	H	H	H	H
20-421	Me	H	H	H	H	H	Ph	H	H	H	Ph	H	H	H	H
20-422	Me	H	H	H	H	H	Ph	H	H	H	H	Ph	H	H	H
20-423	Me	H	H	H	H	H	Ph	H	H	H	H	H	Ph	H	H
20-424	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	Ph	H
20-425	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	H	Ph
20-426	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	H	H
20-427	Ph	H	H	H	H	H	Ph	Me	H	H	H	H	H	H	H
20-428	Ph	H	H	H	H	H	Ph	H	Me	H	H	H	H	H	H
20-429	Ph	H	H	H	H	H	Ph	H	H	Me	H	H	H	H	H
20-430	Ph	H	H	H	H	H	Ph	H	H	H	Me	H	H	H	H
20-431	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	H	H	H
20-432	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me	H	H
20-433	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	Me	H
20-434	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	H	Me
20-435	Ph	H	H	H	H	H	Ph	Ph	H	H	H	H	H	H	H
20-436	Ph	H	H	H	H	H	Ph	H	Ph	H	H	H	H	H	H
20-437	Ph	H	H	H	H	H	Ph	H	H	Ph	H	H	H	H	H
20-438	Ph	H	H	H	H	H	Ph	H	H	H	Ph	H	H	H	H
20-439	Ph	H	H	H	H	H	Ph	H	H	H	H	Ph	H	H	H
20-440	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Ph	H	H

^1H NMR of $[(1\text{-Ph-3-Me-imid})_2IrCl]_2$ in $CDCl_3$

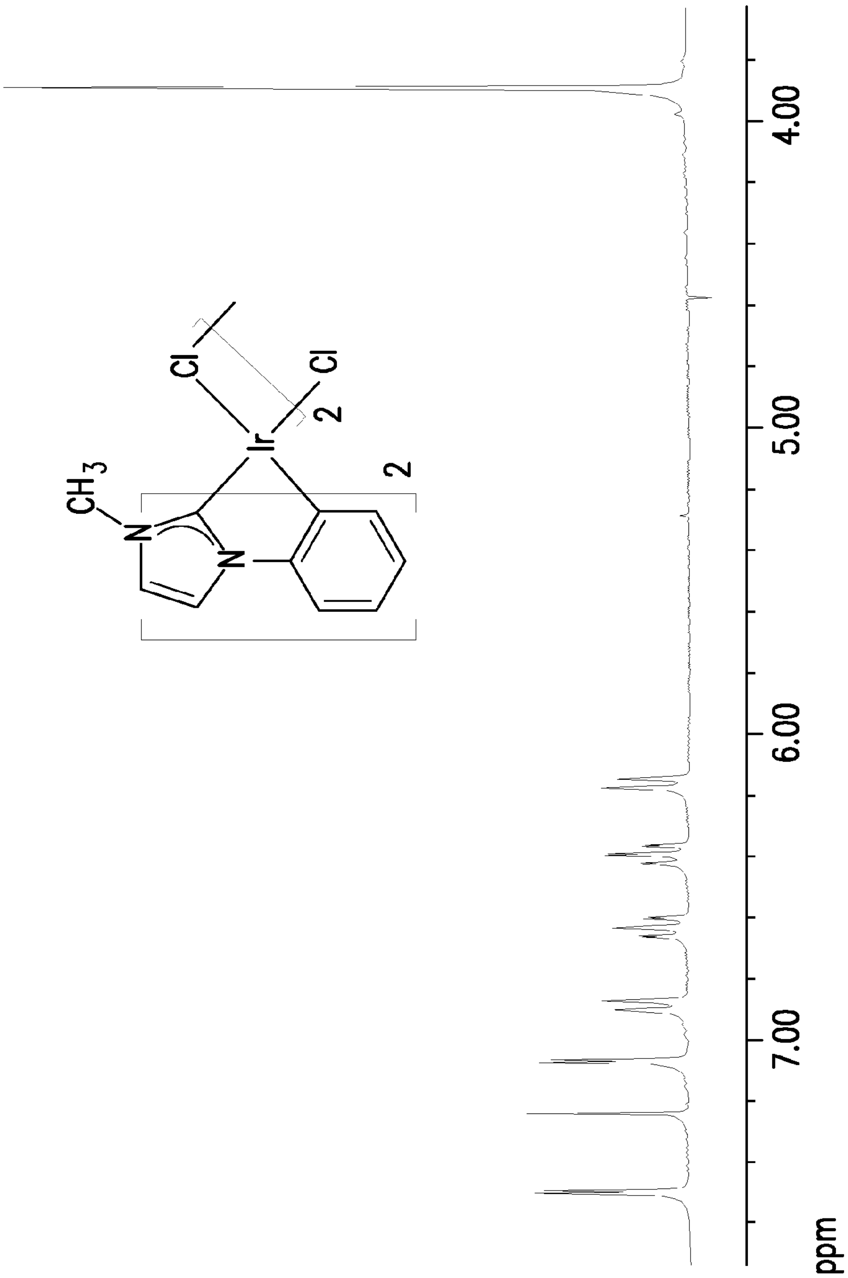


FIG.11

TABLE 20-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
20-441	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	Ph	H
20-442	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	H	Ph

TABLE 21

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5
21-1	Me	H	H	H	H	H	H	Me
21-2	Me	H	H	Me	H	H	H	Me
21-3	Me	H	H	H	Me	H	H	Me
21-4	Me	H	H	H	H	Me	H	Me
21-5	Me	H	H	H	H	H	Me	Me
21-6	Me	H	H	Ph	H	H	H	Me
21-7	Me	H	H	H	Ph	H	H	Me
21-8	Me	H	H	H	H	Ph	H	Me
21-9	Me	H	H	H	H	H	Ph	Me
21-10	Ph	H	H	H	H	H	H	Me
21-11	Ph	H	H	Me	H	H	H	Me
21-12	Ph	H	H	H	Me	H	H	Me
21-13	Ph	H	H	H	H	Me	H	Me
21-14	Ph	H	H	H	H	H	Me	Me
21-15	Ph	H	H	Ph	H	H	H	Me
21-16	Ph	H	H	H	Ph	H	H	Me
21-17	Ph	H	H	H	H	Ph	H	Me
21-18	Ph	H	H	H	H	H	Ph	Me
21-19	Me	Me	H	H	H	H	H	Me
21-20	Me	Me	H	Me	H	H	H	Me
21-21	Me	Me	H	H	Me	H	H	Me
21-22	Me	Me	H	H	H	Me	H	Me
21-23	Me	Me	H	H	H	H	Me	Me
21-24	Me	Me	H	Ph	H	H	H	Me
21-25	Me	Me	H	H	Ph	H	H	Me
21-26	Me	Me	H	H	H	Ph	H	Me
21-27	Me	Me	H	H	H	H	Ph	Me
21-28	Ph	Me	H	H	H	H	H	Me
21-29	Ph	Me	H	Me	H	H	H	Me
21-30	Ph	Me	H	H	Me	H	H	Me
21-31	Ph	Me	H	H	H	Me	H	Me
21-32	Ph	Me	H	H	H	H	Me	Me
21-33	Ph	Me	H	Ph	H	H	H	Me
21-34	Ph	Me	H	H	Ph	H	H	Me
21-35	Ph	Me	H	H	H	Ph	H	Me
21-36	Ph	Me	H	H	H	H	Ph	Me
21-37	Me	H	Me	H	H	H	H	Me
21-38	Me	H	Me	Me	H	H	H	Me
21-39	Me	H	Me	H	Me	H	H	Me
21-40	Me	H	Me	H	H	Me	H	Me
21-41	Me	H	Me	H	H	H	Me	Me
21-42	Me	H	Me	Ph	H	H	H	Me
21-43	Me	H	Me	H	Ph	H	H	Me
21-44	Me	H	Me	H	H	Ph	H	Me
21-45	Me	H	Me	H	H	H	Ph	Me
21-46	Ph	H	Me	H	H	H	H	Me
21-47	Ph	H	Me	Me	H	H	H	Me
21-48	Ph	H	Me	H	Me	H	H	Me
21-49	Ph	H	Me	H	H	Me	H	Me
21-50	Ph	H	Me	H	H	H	Me	Me
21-51	Ph	H	Me	Ph	H	H	H	Me
21-52	Ph	H	Me	H	Ph	H	H	Me
21-53	Ph	H	Me	H	H	Ph	H	Me
21-54	Ph	H	Me	H	H	H	Ph	Me
21-55	Me	Ph	H	H	H	H	H	Me
21-56	Me	Ph	H	Me	H	H	H	Me
21-57	Me	Ph	H	H	Me	H	H	Me
21-58	Me	Ph	H	H	H	Me	H	Me
21-59	Me	Ph	H	H	H	H	Me	Me
21-60	Me	Ph	H	Ph	H	H	H	Me
21-61	Me	Ph	H	H	Ph	H	H	Me
21-62	Me	Ph	H	H	H	Ph	H	Me
21-63	Me	Ph	H	H	H	H	Ph	Me
21-64	Ph	Ph	H	H	H	H	H	Me
21-65	Ph	Ph	H	Me	H	H	H	Me
21-66	Ph	Ph	H	H	Me	H	H	Me
21-67	Ph	Ph	H	H	H	Me	H	Me
21-68	Ph	Ph	H	H	H	H	Me	Me
21-69	Ph	Ph	H	Ph	H	H	H	Me
21-70	Ph	Ph	H	H	Ph	H	H	Me
21-71	Ph	Ph	H	H	H	Ph	H	Me
21-72	Ph	Ph	H	H	H	H	Ph	Me
21-73	Me	H	Ph	H	H	H	H	Me
21-74	Me	H	Ph	Me	H	H	H	Me
21-75	Me	H	Ph	H	Me	H	H	Me
21-76	Me	H	Ph	H	H	Me	H	Me
21-77	Me	H	Ph	H	H	H	Me	Me
21-78	Me	H	Ph	Ph	H	H	H	Me
21-79	Me	H	Ph	H	Ph	H	H	Me
21-80	Me	H	Ph	H	H	Ph	H	Me
21-81	Me	H	Ph	H	H	H	Ph	Me
21-82	Ph	H	Ph	H	H	H	H	Me
21-83	Ph	H	Ph	Me	H	H	H	Me
21-84	Ph	H	Ph	H	Me	H	H	Me
21-85	Ph	H	Ph	H	H	Me	H	Me
21-86	Ph	H	Ph	H	H	H	Me	Me
21-87	Ph	H	Ph	Ph	H	H	H	Me
21-88	Ph	H	Ph	H	Ph	H	H	Me
21-89	Ph	H	Ph	H	H	Ph	H	Me
21-90	Ph	H	Ph	H	H	H	Ph	Me

TABLE 22

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5
22-1	Me	H	H	H	H	H	H	H	Me
22-2	Me	H	H	H	Me	H	H	H	Me
22-3	Me	H	H	H	H	Me	H	H	Me
22-4	Me	H	H	H	H	H	Me	H	Me
22-5	Me	H	H	H	H	H	H	Me	Me
22-6	Me	H	H	H	Ph	H	H	H	Me
22-7	Me	H	H	H	H	Ph	H	H	Me
22-8	Me	H	H	H	H	H	Ph	H	Me
22-9	Me	H	H	H	H	H	H	Ph	Me
22-10	Ph	H	H	H	H	H	H	H	Me
22-11	Ph	H	H	H	Me	H	H	H	Me
22-12	Ph	H	H	H	H	Me	H	H	Me
22-13	Ph	H	H	H	H	H	Me	H	Me
22-14	Ph	H	H	H	H	H	H	Me	Me
22-15	Ph	H	H	H	Ph	H	H	H	Me
22-16	Ph	H	H	H	H	Ph	H	H	Me
22-17	Ph	H	H	H	H	H	Ph	H	Me
22-18	Ph	H	H	H	H	H	H	Ph	Me
22-19	Me	Me	H	H	H	H	H	H	Me
22-20	Me	Me	H	H	Me	H	H	H	Me
22-21	Me	Me	H	H	H	Me	H	H	Me
22-22	Me	Me	H	H	H	H	Me	H	Me
22-23	Me	Me	H	H	H	H	H	Me	Me
22-24	Me	Me	H	H	Ph	H	H	H	Me
22-25	Me	Me	H	H	H	Ph	H	H	Me
22-26	Me	Me	H	H	H	H	Ph	H	Me
22-27	Me	Me	H	H	H	H	H	Ph	Me
22-28	Ph	Me	H	H	H	H	H	H	Me
22-29	Ph	Me	H	H	Me	H	H	H	Me
22-30	Ph	Me	H	H	H	Me	H	H	Me
22-31	Ph	Me	H	H	H	H	Me	H	Me
22-32	Ph	Me	H	H	H	H	H	Me	Me
22-33	Ph	Me	H	H	Ph	H	H	H	Me
22-34	Ph	Me	H	H	H	Ph	H	H	Me
22-35	Ph	Me	H	H	H	H	Ph	H	Me
22-36	Ph	Me	H	H	H	H	H	Ph	Me
22-37	Me	H	Me	H	H	H	H	H	Me
22-38	Me	H	Me	H	Me	H	H	H	Me

TABLE 22-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5
22-39	Me	H	Me	H	H	Me	H	H	Me
22-40	Me	H	Me	H	H	H	Me	H	Me
22-41	Me	H	Me	H	H	H	H	Me	Me
22-42	Me	H	Me	H	Ph	H	H	H	Me
22-43	Me	H	Me	H	H	Ph	H	H	Me
22-44	Me	H	Me	H	H	H	Ph	H	Me
22-45	Me	H	Me	H	H	H	H	Ph	Me
22-46	Ph	H	Me	H	H	H	H	H	Me
22-47	Ph	H	Me	H	Me	H	H	H	Me
22-48	Ph	H	Me	H	H	Me	H	H	Me
22-49	Ph	H	Me	H	H	H	Me	H	Me
22-50	Ph	H	Me	H	H	H	H	Me	Me
22-51	Ph	H	Me	H	Ph	H	H	H	Me
22-52	Ph	H	Me	H	H	Ph	H	H	Me
22-53	Ph	H	Me	H	H	H	Ph	H	Me
22-54	Ph	H	Me	H	H	H	H	Ph	Me
22-55	Me	H	H	Me	H	H	H	H	Me
22-56	Me	H	H	Me	Me	H	H	H	Me
22-57	Me	H	H	Me	H	Me	H	H	Me
22-58	Me	H	H	Me	H	H	Me	H	Me
22-59	Me	H	H	Me	H	H	H	Me	Me
22-60	Me	H	H	Me	Ph	H	H	H	Me
22-61	Me	H	H	Me	H	Ph	H	H	Me
22-62	Me	H	H	Me	H	H	Ph	H	Me
22-63	Me	H	H	Me	H	H	H	Ph	Me
22-64	Ph	H	H	Me	H	H	H	H	Me
22-65	Ph	H	H	Me	Me	H	H	H	Me
22-66	Ph	H	H	Me	H	Me	H	H	Me
22-67	Ph	H	H	Me	H	H	Me	H	Me
22-68	Ph	H	H	Me	H	H	H	Me	Me
22-69	Ph	H	H	Me	Ph	H	H	H	Me
22-70	Ph	H	H	Me	H	Ph	H	H	Me
22-71	Ph	H	H	Me	H	H	Ph	H	Me
22-72	Ph	H	H	Me	H	H	H	Ph	Me
22-73	Me	Ph	H	H	H	H	H	H	Me
22-74	Me	Ph	H	H	Me	H	H	H	Me
22-75	Me	Ph	H	H	H	Me	H	H	Me
22-76	Me	Ph	H	H	H	H	Me	H	Me
22-77	Me	Ph	H	H	H	H	H	Me	Me
22-78	Me	Ph	H	H	Ph	H	H	H	Me
22-79	Me	Ph	H	H	H	Ph	H	H	Me
22-80	Me	Ph	H	H	H	H	Ph	H	Me
22-81	Me	Ph	H	H	H	H	H	Ph	Me
22-82	Ph	Ph	H	H	H	H	H	H	Me
22-83	Ph	Ph	H	H	Me	H	H	H	Me
22-84	Ph	Ph	H	H	H	Me	H	H	Me
22-85	Ph	Ph	H	H	H	H	Me	H	Me
22-86	Ph	Ph	H	H	H	H	H	Me	Me
22-87	Ph	Ph	H	H	Ph	H	H	H	Me
22-88	Ph	Ph	H	H	H	Ph	H	H	Me
22-89	Ph	Ph	H	H	H	H	Ph	H	Me
22-90	Ph	Ph	H	H	H	H	H	Ph	Me
22-91	Me	H	Ph	H	H	H	H	H	Me
22-92	Me	H	Ph	H	Me	H	H	H	Me
22-93	Me	H	Ph	H	H	Me	H	H	Me
22-94	Me	H	Ph	H	H	H	Me	H	Me
22-95	Me	H	Ph	H	H	H	H	Me	Me
22-96	Me	H	Ph	H	Ph	H	H	H	Me
22-97	Me	H	Ph	H	H	Ph	H	H	Me
22-98	Me	H	Ph	H	H	H	Ph	H	Me
22-99	Me	H	Ph	H	H	H	H	Ph	Me
22-100	Ph	H	Ph	H	H	H	H	H	Me
22-101	Ph	H	Ph	H	Me	H	H	H	Me
22-102	Ph	H	Ph	H	H	Me	H	H	Me
22-103	Ph	H	Ph	H	H	H	Me	H	Me
22-104	Ph	H	Ph	H	H	H	H	Me	Me
22-105	Ph	H	Ph	H	Ph	H	H	H	Me
22-106	Ph	H	Ph	H	H	Ph	H	H	Me
22-107	Ph	H	Ph	H	H	H	Ph	H	Me
22-108	Ph	H	Ph	H	H	H	H	Ph	Me
22-109	Me	H	H	Ph	H	H	H	H	Me
22-110	Me	H	H	Ph	Me	H	H	H	Me
22-111	Me	H	H	Ph	H	Me	H	H	Me
22-112	Me	H	H	Ph	H	H	Me	H	Me
22-113	Me	H	H	Ph	H	H	H	Me	Me
22-114	Me	H	H	Ph	Ph	H	H	H	Me
22-115	Me	H	H	Ph	H	Ph	H	H	Me
22-116	Me	H	H	Ph	H	H	Ph	H	Me
22-117	Me	H	H	Ph	H	H	H	Ph	Me
22-118	Ph	H	H	Ph	H	H	H	H	Me
22-119	Ph	H	H	Ph	Me	H	H	H	Me
22-120	Ph	H	H	Ph	H	Me	H	H	Me
22-121	Ph	H	H	Ph	H	H	Me	H	Me
22-122	Ph	H	H	Ph	H	H	H	Me	Me
22-123	Ph	H	H	Ph	Ph	H	H	H	Me
22-124	Ph	H	H	Ph	H	Ph	H	H	Me
22-125	Ph	H	H	Ph	H	H	Ph	H	Me
22-126	Ph	H	H	Ph	H	H	H	Ph	Me

TABLE 23

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5
23-1	Me	H	H	H	H	H	H	H	H	Me
23-2	Me	H	H	H	H	Me	H	H	H	Me
23-3	Me	H	H	H	H	H	Me	H	H	Me
23-4	Me	H	H	H	H	H	H	Me	H	Me
23-5	Me	H	H	H	H	H	H	H	Me	Me
23-6	Me	H	H	H	H	Ph	H	H	H	Me
23-7	Me	H	H	H	H	H	Ph	H	H	Me
23-8	Me	H	H	H	H	H	H	Ph	H	Me
23-9	Me	H	H	H	H	H	H	H	Ph	Me
23-10	Ph	H	H	H	H	H	H	H	H	Me
23-11	Ph	H	H	H	H	Me	H	H	H	Me
23-12	Ph	H	H	H	H	H	Me	H	H	Me
23-13	Ph	H	H	H	H	H	H	Me	H	Me
23-14	Ph	H	H	H	H	H	H	H	Me	Me
23-15	Ph	H	H	H	H	Ph	H	H	H	Me
23-16	Ph	H	H	H	H	H	Ph	H	H	Me
23-17	Ph	H	H	H	H	H	H	Ph	H	Me
23-18	Ph	H	H	H	H	H	H	H	Ph	Me
23-19	Me	Me	H	H	H	H	H	H	H	Me
23-20	Me	Me	H	H	H	Me	H	H	H	Me
23-21	Me	Me	H	H	H	H	Me	H	H	Me
23-22	Me	Me	H	H	H	H	H	Me	H	Me
23-23	Me	Me	H	H	H	H	H	H	Me	Me
23-24	Me	Me	H	H	H	Ph	H	H	H	Me
23-25	Me	Me	H	H	H	H	Ph	H	H	Me

TABLE 23-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5
23-26	Me	Me	H	H	H	H	H	Ph	H	Me
23-27	Me	Me	H	H	H	H	H	H	Ph	Me
23-28	Ph	Me	H	H	H	H	H	H	H	Me
23-29	Ph	Me	H	H	H	Me	H	H	H	Me
23-30	Ph	Me	H	H	H	H	Me	H	H	Me
23-31	Ph	Me	H	H	H	H	H	Me	H	Me
23-32	Ph	Me	H	H	H	H	H	H	Me	Me
23-33	Ph	Me	H	H	H	Ph	H	H	H	Me
23-34	Ph	Me	H	H	H	H	Ph	H	H	Me
23-35	Ph	Me	H	H	H	H	H	Ph	H	Me
23-36	Ph	Me	H	H	H	H	H	H	Ph	Me
23-37	Me	H	Me	H	H	H	H	H	H	Me
23-38	Me	H	Me	H	H	Me	H	H	H	Me
23-39	Me	H	Me	H	H	H	Me	H	H	Me
23-40	Me	H	Me	H	H	H	H	Me	H	Me
23-41	Me	H	Me	H	H	H	H	H	Me	Me
23-42	Me	H	Me	H	H	Ph	H	H	H	Me
23-43	Me	H	Me	H	H	H	Ph	H	H	Me
23-44	Me	H	Me	H	H	H	H	Ph	H	Me
23-45	Me	H	Me	H	H	H	H	H	Ph	Me
23-46	Ph	H	Me	H	H	H	H	H	H	Me
23-47	Ph	H	Me	H	H	Me	H	H	H	Me
23-48	Ph	H	Me	H	H	H	Me	H	H	Me
23-49	Ph	H	Me	H	H	H	H	Me	H	Me
23-50	Ph	H	Me	H	H	H	H	H	Me	Me
23-51	Ph	H	Me	H	H	Ph	H	H	H	Me
23-52	Ph	H	Me	H	H	H	Ph	H	H	Me
23-53	Ph	H	Me	H	H	H	H	Ph	H	Me
23-54	Ph	H	Me	H	H	H	H	H	Ph	Me
23-55	Me	H	H	Me	H	H	H	H	H	Me
23-56	Me	H	H	Me	H	Me	H	H	H	Me
23-57	Me	H	H	Me	H	H	Me	H	H	Me
23-58	Me	H	H	Me	H	H	H	Me	H	Me
23-59	Me	H	H	Me	H	H	H	H	Me	Me
23-60	Me	H	H	Me	H	Ph	H	H	H	Me
23-61	Me	H	H	Me	H	H	Ph	H	H	Me
23-62	Me	H	H	Me	H	H	H	Ph	H	Me
23-63	Me	H	H	Me	H	H	H	H	Ph	Me
23-64	Ph	H	H	Me	H	H	H	H	H	Me
23-65	Ph	H	H	Me	H	Me	H	H	H	Me
23-66	Ph	H	H	Me	H	H	Me	H	H	Me
23-67	Ph	H	H	Me	H	H	H	Me	H	Me
23-68	Ph	H	H	Me	H	H	H	H	Me	Me
23-69	Ph	H	H	Me	H	Ph	H	H	H	Me
23-70	Ph	H	H	Me	H	H	Ph	H	H	Me
23-71	Ph	H	H	Me	H	H	H	Ph	H	Me
23-72	Ph	H	H	Me	H	H	H	H	Ph	Me
23-73	Me	H	H	H	Me	H	H	H	H	Me
23-74	Me	H	H	H	Me	Me	H	H	H	Me
23-75	Me	H	H	H	Me	H	Me	H	H	Me
23-76	Me	H	H	H	Me	H	H	Me	H	Me
23-77	Me	H	H	H	Me	H	H	H	Me	Me
23-78	Me	H	H	H	Me	Ph	H	H	H	Me
23-79	Me	H	H	H	Me	H	Ph	H	H	Me
23-80	Me	H	H	H	Me	H	H	Ph	H	Me
23-81	Me	H	H	H	Me	H	H	H	Ph	Me
23-82	Ph	H	H	H	Me	H	H	H	H	Me
23-83	Ph	H	H	H	Me	Me	H	H	H	Me
23-84	Ph	H	H	H	Me	H	Me	H	H	Me
23-85	Ph	H	H	H	Me	H	H	Me	H	Me
23-86	Ph	H	H	H	Me	H	H	H	Me	Me
23-87	Ph	H	H	H	Me	Ph	H	H	H	Me
23-88	Ph	H	H	H	Me	H	Ph	H	H	Me
23-89	Ph	H	H	H	Me	H	H	Ph	H	Me
23-90	Ph	H	H	H	Me	H	H	H	Ph	Me
23-91	Me	Ph	H	H	H	H	H	H	H	Me
23-92	Me	Ph	H	H	H	Me	H	H	H	Me
23-93	Me	Ph	H	H	H	H	Me	H	H	Me
23-94	Me	Ph	H	H	H	H	H	Me	H	Me
23-95	Me	Ph	H	H	H	H	H	H	Me	Me
23-96	Me	Ph	H	H	H	Ph	H	H	H	Me
23-97	Me	Ph	H	H	H	H	Ph	H	H	Me
23-98	Me	Ph	H	H	H	H	H	Ph	H	Me
23-99	Me	Ph	H	H	H	H	H	H	Ph	Me
23-100	Ph	Ph	H	H	H	H	H	H	H	Me
23-101	Ph	Ph	H	H	H	Me	H	H	H	Me
23-102	Ph	Ph	H	H	H	H	Me	H	H	Me
23-103	Ph	Ph	H	H	H	H	H	Me	H	Me

TABLE 23-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5
23-104	Ph	Ph	H	H	H	H	H	H	Me	Me
23-105	Ph	Ph	H	H	H	Ph	H	H	H	Me
23-106	Ph	Ph	H	H	H	H	Ph	H	H	Me
23-107	Ph	Ph	H	H	H	H	H	Ph	H	Me
23-108	Ph	Ph	H	H	H	H	H	H	Ph	Me
23-109	Me	H	Ph	H	H	H	H	H	H	Me
23-110	Me	H	Ph	H	H	Me	H	H	H	Me
23-111	Me	H	Ph	H	H	H	Me	H	H	Me
23-112	Me	H	Ph	H	H	H	H	Me	H	Me
23-113	Me	H	Ph	H	H	H	H	H	Me	Me
23-114	Me	H	Ph	H	H	Ph	H	H	H	Me
23-115	Me	H	Ph	H	H	H	Ph	H	H	Me
23-116	Me	H	Ph	H	H	H	H	Ph	H	Me
23-117	Me	H	Ph	H	H	H	H	H	Ph	Me
23-118	Ph	H	Ph	H	H	H	H	H	H	Me
23-119	Ph	H	Ph	H	H	Me	H	H	H	Me
23-120	Ph	H	Ph	H	H	H	Me	H	H	Me
23-121	Ph	H	Ph	H	H	H	H	Me	H	Me
23-122	Ph	H	Ph	H	H	H	H	H	Me	Me
23-123	Ph	H	Ph	H	H	Ph	H	H	H	Me
23-124	Ph	H	Ph	H	H	H	Ph	H	H	Me
23-125	Ph	H	Ph	H	H	H	H	Ph	H	Me
23-126	Ph	H	Ph	H	H	H	H	H	Ph	Me
23-127	Me	H	H	Ph	H	H	H	H	H	Me
23-128	Me	H	H	Ph	H	Me	H	H	H	Me
23-129	Me	H	H	Ph	H	H	Me	H	H	Me
23-130	Me	H	H	Ph	H	H	H	Me	H	Me
23-131	Me	H	H	Ph	H	H	H	H	Me	Me
23-132	Me	H	H	Ph	H	Ph	H	H	H	Me
23-133	Me	H	H	Ph	H	H	Ph	H	H	Me
23-134	Me	H	H	Ph	H	H	H	Ph	H	Me
23-135	Me	H	H	Ph	H	H	H	H	Ph	Me
23-136	Ph	H	H	Ph	H	H	H	H	H	Me
23-137	Ph	H	H	Ph	H	Me	H	H	H	Me
23-138	Ph	H	H	Ph	H	H	Me	H	H	Me
23-139	Ph	H	H	Ph	H	H	H	Me	H	Me
23-140	Ph	H	H	Ph	H	H	H	H	Me	Me
23-141	Ph	H	H	Ph	H	Ph	H	H	H	Me
23-142	Ph	H	H	Ph	H	H	Ph	H	H	Me
23-143	Ph	H	H	Ph	H	H	H	Ph	H	Me
23-144	Ph	H	H	Ph	H	H	H	H	Ph	Me
23-145	Me	H	H	H	Ph	H	H	H	H	Me
23-146	Me	H	H	H	Ph	Me	H	H	H	Me
23-147	Me	H	H	H	Ph	H	Me	H	H	Me
23-148	Me	H	H	H	Ph	H	H	Me	H	Me
23-149	Me	H	H	H	Ph	H	H	H	Me	Me
23-150	Me	H	H	H	Ph	Ph	H	H	H	Me
23-151	Me	H	H	H	Ph	H	Ph	H	H	Me
23-152	Me	H	H	H	Ph	H	H	Ph	H	Me
23-153	Me	H	H	H	Ph	H	H	H	Ph	Me
23-154	Ph	H	H	H	Ph	H	H	H	H	Me
23-155	Ph	H	H	H	Ph	Me	H	H	H	Me
23-156	Ph	H	H	H	Ph	H	Me	H	H	Me
23-157	Ph	H	H	H	Ph	H	H	Me	H	Me
23-158	Ph	H	H	H	Ph	H	H	H	Me	Me
23-159	Ph	H	H	H	Ph	Ph	H	H	H	Me
23-160	Ph	H	H	H	Ph	H	Ph	H	H	Me
23-161	Ph	H	H	H	Ph	H	H	Ph	H	Me
23-162	Ph	H	H	H	Ph	H	H	H	Ph	Me

TABLE 24

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5
24-1	Me	H	H	H	H	H	H	H	H	H	H	Me
24-2	Me	H	H	H	H	H	H	Me	H	H	H	Me
24-3	Me	H	H	H	H	H	H	H	Me	H	H	Me
24-4	Me	H	H	H	H	H	H	H	H	Me	H	Me
24-5	Me	H	H	H	H	H	H	H	H	H	Me	Me
24-6	Me	H	H	H	H	H	H	Ph	H	H	H	Me
24-7	Me	H	H	H	H	H	H	H	Ph	H	H	Me
24-8	Me	H	H	H	H	H	H	H	H	Ph	H	Me
24-9	Me	H	H	H	H	H	H	H	H	H	Ph	Me
24-10	Ph	H	H	H	H	H	H	H	H	H	H	Me
24-11	Ph	H	H	H	H	H	H	Me	H	H	H	Me

TABLE 24-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5
24-12	Ph	H	H	H	H	H	H	H	Me	H	H	Me
24-13	Ph	H	H	H	H	H	H	H	H	Me	H	Me
24-14	Ph	H	H	H	H	H	H	H	H	H	Me	Me
24-15	Ph	H	H	H	H	H	H	Ph	H	H	H	Me
24-16	Ph	H	H	H	H	H	H	H	Ph	H	H	Me
24-17	Ph	H	H	H	H	H	H	H	H	Ph	H	Me
24-18	Ph	H	H	H	H	H	H	H	H	H	Ph	Me
24-19	Me	Me	H	H	H	H	H	H	H	H	H	Me
24-20	Me	Me	H	H	H	H	H	Me	H	H	H	Me
24-21	Me	Me	H	H	H	H	H	H	Me	H	H	Me
24-22	Me	Me	H	H	H	H	H	H	H	Me	H	Me
24-23	Me	Me	H	H	H	H	H	H	H	H	Me	Me
24-24	Me	Me	H	H	H	H	H	Ph	H	H	H	Me
24-25	Me	Me	H	H	H	H	H	H	Ph	H	H	Me
24-26	Me	Me	H	H	H	H	H	H	H	Ph	H	Me
24-27	Me	Me	H	H	H	H	H	H	H	H	Ph	Me
24-28	Ph	Me	H	H	H	H	H	H	H	H	H	Me
24-29	Ph	Me	H	H	H	H	H	Me	H	H	H	Me
24-30	Ph	Me	H	H	H	H	H	H	Me	H	H	Me
24-31	Ph	Me	H	H	H	H	H	H	H	Me	H	Me
24-32	Ph	Me	H	H	H	H	H	H	H	H	Me	Me
24-33	Ph	Me	H	H	H	H	H	Ph	H	H	H	Me
24-34	Ph	Me	H	H	H	H	H	H	Ph	H	H	Me
24-35	Ph	Me	H	H	H	H	H	H	H	Ph	H	Me
24-36	Ph	Me	H	H	H	H	H	H	H	H	Ph	Me
24-37	Me	H	Me	H	H	H	H	H	H	H	H	Me
24-38	Me	H	Me	H	H	H	H	Me	H	H	H	Me
24-39	Me	H	Me	H	H	H	H	H	Me	H	H	Me
24-40	Me	H	Me	H	H	H	H	H	H	Me	H	Me
24-41	Me	H	Me	H	H	H	H	H	H	H	Me	Me
24-42	Me	H	Me	H	H	H	H	Ph	H	H	H	Me
24-43	Me	H	Me	H	H	H	H	H	Ph	H	H	Me
24-44	Me	H	Me	H	H	H	H	H	H	Ph	H	Me
24-45	Me	H	Me	H	H	H	H	H	H	H	Ph	Me
24-46	Ph	H	Me	H	H	H	H	H	H	H	H	Me
24-47	Ph	H	Me	H	H	H	H	Me	H	H	H	Me
24-48	Ph	H	Me	H	H	H	H	H	Me	H	H	Me
24-49	Ph	H	Me	H	H	H	H	H	H	Me	H	Me
24-50	Ph	H	Me	H	H	H	H	H	H	H	Me	Me
24-51	Ph	H	Me	H	H	H	H	Ph	H	H	H	Me
24-52	Ph	H	Me	H	H	H	H	H	Ph	H	H	Me
24-53	Ph	H	Me	H	H	H	H	H	H	Ph	H	Me
24-54	Ph	H	Me	H	H	H	H	H	H	H	Ph	Me
24-55	Me	H	H	Me	H	H	H	H	H	H	H	Me
24-56	Me	H	H	Me	H	H	H	Me	H	H	H	Me
24-57	Me	H	H	Me	H	H	H	H	Me	H	H	Me
24-58	Me	H	H	Me	H	H	H	H	H	Me	H	Me
24-59	Me	H	H	Me	H	H	H	H	H	H	Me	Me
24-60	Me	H	H	Me	H	H	H	Ph	H	H	H	Me
24-61	Me	H	H	Me	H	H	H	H	Ph	H	H	Me
24-62	Me	H	H	Me	H	H	H	H	H	Ph	H	Me
24-63	Me	H	H	Me	H	H	H	H	H	H	Ph	Me
24-64	Ph	H	H	Me	H	H	H	H	H	H	H	Me
24-65	Ph	H	H	Me	H	H	H	Me	H	H	H	Me
24-66	Ph	H	H	Me	H	H	H	H	Me	H	H	Me
24-67	Ph	H	H	Me	H	H	H	H	H	Me	H	Me
24-68	Ph	H	H	Me	H	H	H	H	H	H	Me	Me
24-69	Ph	H	H	Me	H	H	H	Ph	H	H	H	Me
24-70	Ph	H	H	Me	H	H	H	H	Ph	H	H	Me
24-71	Ph	H	H	Me	H	H	H	H	H	Ph	H	Me
24-72	Ph	H	H	Me	H	H	H	H	H	H	Ph	Me
24-73	Me	H	H	H	Me	H	H	H	H	H	H	Me
24-74	Me	H	H	H	Me	H	H	Me	H	H	H	Me
24-75	Me	H	H	H	Me	H	H	H	Me	H	H	Me
24-76	Me	H	H	H	Me	H	H	H	H	Me	H	Me
24-77	Me	H	H	H	Me	H	H	H	H	H	Me	Me
24-78	Me	H	H	H	Me	H	H	Ph	H	H	H	Me
24-79	Me	H	H	H	Me	H	H	H	Ph	H	H	Me
24-80	Me	H	H	H	Me	H	H	H	H	Ph	H	Me
24-81	Me	H	H	H	Me	H	H	H	H	H	Ph	Me
24-82	Ph	H	H	H	Me	H	H	H	H	H	H	Me
24-83	Ph	H	H	H	Me	H	H	Me	H	H	H	Me
24-84	Ph	H	H	H	Me	H	H	H	Me	H	H	Me
24-85	Ph	H	H	H	Me	H	H	H	H	Me	H	Me
24-86	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
24-87	Ph	H	H	H	Me	H	H	Ph	H	H	H	Me
24-88	Ph	H	H	H	Me	H	H	H	Ph	H	H	Me
24-89	Ph	H	H	H	Me	H	H	H	H	Ph	H	Me

TABLE 24-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5
24-90	Ph	H	H	H	Me	H	H	H	H	H	Ph	Me
24-91	Me	H	H	H	H	Me	H	H	H	H	H	Me
24-92	Me	H	H	H	H	Me	H	Me	H	H	H	Me
24-93	Me	H	H	H	H	Me	H	H	Me	H	H	Me
24-94	Me	H	H	H	H	Me	H	H	H	Me	H	Me
24-95	Me	H	H	H	H	Me	H	H	H	H	Me	Me
24-96	Me	H	H	H	H	Me	H	Ph	H	H	H	Me
24-97	Me	H	H	H	H	Me	H	H	Ph	H	H	Me
24-98	Me	H	H	H	H	Me	H	H	H	Ph	H	Me
24-99	Me	H	H	H	H	Me	H	H	H	H	Ph	Me
24-100	Ph	H	H	H	H	Me	H	H	H	H	H	Me
24-101	Ph	H	H	H	H	Me	H	Me	H	H	H	Me
24-102	Ph	H	H	H	H	Me	H	H	Me	H	H	Me
24-103	Ph	H	H	H	H	Me	H	H	H	Me	H	Me
24-104	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
24-105	Ph	H	H	H	H	Me	H	Ph	H	H	H	Me
24-106	Ph	H	H	H	H	Me	H	H	Ph	H	H	Me
24-107	Ph	H	H	H	H	Me	H	H	H	Ph	H	Me
24-108	Ph	H	H	H	H	Me	H	H	H	H	Ph	Me
24-109	Me	H	H	H	H	H	Me	H	H	H	H	Me
24-110	Me	H	H	H	H	H	Me	Me	H	H	H	Me
24-111	Me	H	H	H	H	H	Me	H	Me	H	H	Me
24-112	Me	H	H	H	H	H	Me	H	H	Me	H	Me
24-113	Me	H	H	H	H	H	Me	H	H	H	Me	Me
24-114	Me	H	H	H	H	H	Me	Ph	H	H	H	Me
24-115	Me	H	H	H	H	H	Me	H	Ph	H	H	Me
24-116	Me	H	H	H	H	H	Me	H	H	Ph	H	Me
24-117	Me	H	H	H	H	H	Me	H	H	H	Ph	Me
24-118	Ph	H	H	H	H	H	Me	H	H	H	H	Me
24-119	Ph	H	H	H	H	H	Me	Me	H	H	H	Me
24-120	Ph	H	H	H	H	H	Me	H	Me	H	H	Me
24-121	Ph	H	H	H	H	H	Me	H	H	Me	H	Me
24-122	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
24-123	Ph	H	H	H	H	H	Me	Ph	H	H	H	Me
24-124	Ph	H	H	H	H	H	Me	H	Ph	H	H	Me
24-125	Ph	H	H	H	H	H	Me	H	H	Ph	H	Me
24-126	Ph	H	H	H	H	H	Me	H	H	H	Ph	Me
24-127	Me	Ph	H	H	H	H	H	H	H	H	H	Me
24-128	Me	Ph	H	H	H	H	H	Me	H	H	H	Me
24-129	Me	Ph	H	H	H	H	H	H	Me	H	H	Me
24-130	Me	Ph	H	H	H	H	H	H	H	Me	H	Me
24-131	Me	Ph	H	H	H	H	H	H	H	H	Me	Me
24-132	Me	Ph	H	H	H	H	H	Ph	H	H	H	Me
24-133	Me	Ph	H	H	H	H	H	H	Ph	H	H	Me
24-134	Me	Ph	H	H	H	H	H	H	H	Ph	H	Me
24-135	Me	Ph	H	H	H	H	H	H	H	H	Ph	Me
24-136	Ph	Ph	H	H	H	H	H	H	H	H	H	Me
24-137	Ph	Ph	H	H	H	H	H	Me	H	H	H	Me
24-138	Ph	Ph	H	H	H	H	H	H	Me	H	H	Me
24-139	Ph	Ph	H	H	H	H	H	H	H	Me	H	Me
24-140	Ph	Ph	H	H	H	H	H	H	H	H	Me	Me
24-141	Ph	Ph	H	H	H	H	H	Ph	H	H	H	Me
24-142	Ph	Ph	H	H	H	H	H	H	Ph	H	H	Me
24-143	Ph	Ph	H	H	H	H	H	H	H	Ph	H	Me
24-144	Ph	Ph	H	H	H	H	H	H	H	H	Ph	Me
24-145	Me	H	Ph	H	H	H	H	H	H	H	H	Me
24-146	Me	H	Ph	H	H	H	H	Me	H	H	H	Me
24-147	Me	H	Ph	H	H	H	H	H	Me	H	H	Me
24-148	Me	H	Ph	H	H	H	H	H	H	Me	H	Me
24-149	Me	H	Ph	H	H	H	H	H	H	H	Me	Me
24-150	Me	H	Ph	H	H	H	H	Ph	H	H	H	Me
24-151	Me	H	Ph	H	H	H	H	H	Ph	H	H	Me
24-152	Me	H	Ph	H	H	H	H	H	H	Ph	H	Me
24-153	Me	H	Ph	H	H	H	H	H	H	H	Ph	Me
24-154	Ph	H	Ph	H	H	H	H	H	H	H	H	Me
24-155	Ph	H	Ph	H	H	H	H	Me	H	H	H	Me
24-156	Ph	H	Ph	H	H	H	H	H	Me	H	H	Me
24-157	Ph	H	Ph	H	H	H	H	H	H	Me	H	Me
24-158	Ph	H	Ph	H	H	H	H	H	H	H	Me	Me
24-159	Ph	H	Ph	H	H	H	H	Ph	H	H	H	Me
24-160	Ph	H	Ph	H	H	H	H	H	Ph	H	H	Me
24-161	Ph	H	Ph	H	H	H	H	H	H	Ph	H	Me
24-162	Ph	H	Ph	H	H	H	H	H	H	H	Ph	Me
24-163	Me	H	H	Ph	H	H	H	H	H	H	H	Me
24-164	Me	H	H	Ph	H	H	H	Me	H	H	H	Me
24-165	Me	H	H	Ph	H	H	H	H	Me	H	H	Me
24-166	Me	H	H	Ph	H	H	H	H	H	Me	H	Me
24-167	Me	H	H	Ph	H	H	H	H	H	H	Me	Me

TABLE 24-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5
24-168	Me	H	H	Ph	H	H	H	Ph	H	H	H	Me
24-169	Me	H	H	Ph	H	H	H	H	Ph	H	H	Me
24-170	Me	H	H	Ph	H	H	H	H	H	Ph	H	Me
24-171	Me	H	H	Ph	H	H	H	H	H	H	Ph	Me
24-172	Ph	H	H	Ph	H	H	H	H	H	H	H	Me
24-173	Ph	H	H	Ph	H	H	H	Me	H	H	H	Me
24-174	Ph	H	H	Ph	H	H	H	H	Me	H	H	Me
24-175	Ph	H	H	Ph	H	H	H	H	H	Me	H	Me
24-176	Ph	H	H	Ph	H	H	H	H	H	H	Me	Me
24-177	Ph	H	H	Ph	H	H	H	Ph	H	H	H	Me
24-178	Ph	H	H	Ph	H	H	H	H	Ph	H	H	Me
24-179	Ph	H	H	Ph	H	H	H	H	H	Ph	H	Me
24-180	Ph	H	H	Ph	H	H	H	H	H	H	Ph	Me
24-181	Me	H	H	H	Ph	H	H	H	H	H	H	Me
24-182	Me	H	H	H	Ph	H	H	Me	H	H	H	Me
24-183	Me	H	H	H	Ph	H	H	H	Me	H	H	Me
24-184	Me	H	H	H	Ph	H	H	H	H	Me	H	Me
24-185	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
24-186	Me	H	H	H	Ph	H	H	Ph	H	H	H	Me
24-187	Me	H	H	H	Ph	H	H	H	Ph	H	H	Me
24-188	Me	H	H	H	Ph	H	H	H	H	Ph	H	Me
24-189	Me	H	H	H	Ph	H	H	H	H	H	Ph	Me
24-190	Ph	H	H	H	Ph	H	H	H	H	H	H	Me
24-191	Ph	H	H	H	Ph	H	H	Me	H	H	H	Me
24-192	Ph	H	H	H	Ph	H	H	H	Me	H	H	Me
24-193	Ph	H	H	H	Ph	H	H	H	H	Me	H	Me
24-194	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
24-195	Ph	H	H	H	Ph	H	H	Ph	H	H	H	Me
24-196	Ph	H	H	H	Ph	H	H	H	Ph	H	H	Me
24-197	Ph	H	H	H	Ph	H	H	H	H	Ph	H	Me
24-198	Ph	H	H	H	Ph	H	H	H	H	H	Ph	Me
24-199	Me	H	H	H	H	Ph	H	H	H	H	H	Me
24-200	Me	H	H	H	H	Ph	H	Me	H	H	H	Me
24-201	Me	H	H	H	H	Ph	H	H	Me	H	H	Me
24-202	Me	H	H	H	H	Ph	H	H	H	Me	H	Me
24-203	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
24-204	Me	H	H	H	H	Ph	H	Ph	H	H	H	Me
24-205	Me	H	H	H	H	Ph	H	H	Ph	H	H	Me
24-206	Me	H	H	H	H	Ph	H	H	H	Ph	H	Me
24-207	Me	H	H	H	H	Ph	H	H	H	H	Ph	Me
24-208	Ph	H	H	H	H	Ph	H	H	H	H	H	Me
24-209	Ph	H	H	H	H	Ph	H	Me	H	H	H	Me
24-210	Ph	H	H	H	H	Ph	H	H	Me	H	H	Me
24-211	Ph	H	H	H	H	Ph	H	H	H	Me	H	Me
24-212	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
24-213	Ph	H	H	H	H	Ph	H	Ph	H	H	H	Me
24-214	Ph	H	H	H	H	Ph	H	H	Ph	H	H	Me
24-215	Ph	H	H	H	H	Ph	H	H	H	Ph	H	Me
24-216	Ph	H	H	H	H	Ph	H	H	H	H	Ph	Me
24-217	Me	H	H	H	H	H	Ph	H	H	H	H	Me
24-218	Me	H	H	H	H	H	Ph	Me	H	H	H	Me
24-219	Me	H	H	H	H	H	Ph	H	Me	H	H	Me
24-220	Me	H	H	H	H	H	Ph	H	H	Me	H	Me
24-221	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
24-222	Me	H	H	H	H	H	Ph	Ph	H	H	H	Me
24-223	Me	H	H	H	H	H	Ph	H	Ph	H	H	Me
24-224	Me	H	H	H	H	H	Ph	H	H	Ph	H	Me
24-225	Me	H	H	H	H	H	Ph	H	H	H	Ph	Me
24-226	Ph	H	H	H	H	H	Ph	H	H	H	H	Me
24-227	Ph	H	H	H	H	H	Ph	Me	H	H	H	Me
24-228	Ph	H	H	H	H	H	Ph	H	Me	H	H	Me
24-229	Ph	H	H	H	H	H	Ph	H	H	Me	H	Me
24-230	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
24-231	Ph	H	H	H	H	H	Ph	Ph	H	H	H	Me
24-232	Ph	H	H	H	H	H	Ph	H	Ph	H	H	Me
24-233	Ph	H	H	H	H	H	Ph	H	H	Ph	H	Me
24-234	Ph	H	H	H	H	H	Ph	H	H	H	Ph	Me

TABLE 25

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2
25-1	Me	Me	Me	H	H
25-2	Me	Me	Me	Me	H
25-3	Me	Me	Me	H	Me

TABLE 25-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2
25-4	Me	Me	Me	Ph	H
25-5	Me	Me	Me	H	Ph
25-6	Ph	Me	Me	H	H

TABLE 25-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2
25-7	Ph	Me	Me	Me	H
25-8	Ph	Me	Me	H	Me
25-9	Ph	Me	Me	Ph	H
25-10	Ph	Me	Me	H	Ph
25-11	Me	Ph	Me	H	H
25-12	Me	Ph	Me	Me	H
25-13	Me	Ph	Me	H	Me
25-14	Me	Ph	Me	Ph	H
25-15	Me	Ph	Me	H	Ph
25-16	Ph	Ph	Me	H	H
25-17	Ph	Ph	Me	Me	H
25-18	Ph	Ph	Me	H	Me
25-19	Ph	Ph	Me	Ph	H
25-20	Ph	Ph	Me	H	Ph
25-21	Me	Me	Ph	H	H
25-22	Me	Me	Ph	Me	H
25-23	Me	Me	Ph	H	Me
25-24	Me	Me	Ph	Ph	H
25-25	Me	Me	Ph	H	Ph
25-26	Ph	Me	Ph	H	H
25-27	Ph	Me	Ph	Me	H
25-28	Ph	Me	Ph	H	Me
25-29	Ph	Me	Ph	Ph	H
25-30	Ph	Me	Ph	H	Ph
25-31	Me	Ph	Ph	H	H
25-32	Me	Ph	Ph	Me	H
25-33	Me	Ph	Ph	H	Me
25-34	Me	Ph	Ph	Ph	H
25-35	Me	Ph	Ph	H	Ph
25-36	Ph	Ph	Ph	H	H
25-37	Ph	Ph	Ph	Me	H
25-38	Ph	Ph	Ph	H	Me
25-39	Ph	Ph	Ph	Ph	H
25-40	Ph	Ph	Ph	H	Ph

TABLE 26

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4
26-1	Me	Me	Me	H	H	H	H
26-2	Me	Me	Me	Me	H	H	H
26-3	Me	Me	Me	H	Me	H	H
26-4	Me	Me	Me	H	H	Me	H
26-5	Me	Me	Me	H	H	H	Me
26-6	Me	Me	Me	Ph	H	H	H
26-7	Me	Me	Me	H	Ph	H	H
26-8	Me	Me	Me	H	H	Ph	H
26-9	Me	Me	Me	H	H	H	Ph
26-10	Ph	Me	Me	H	H	H	H
26-11	Ph	Me	Me	Me	H	H	H
26-12	Ph	Me	Me	H	Me	H	H
26-13	Ph	Me	Me	H	H	Me	H
26-14	Ph	Me	Me	H	H	H	Me
26-15	Ph	Me	Me	Ph	H	H	H
26-16	Ph	Me	Me	H	Ph	H	H
26-17	Ph	Me	Me	H	H	Ph	H
26-18	Ph	Me	Me	H	H	H	Ph
26-19	Me	Ph	Me	H	H	H	H
26-20	Me	Ph	Me	Me	H	H	H
26-21	Me	Ph	Me	H	Me	H	H
26-22	Me	Ph	Me	H	H	Me	H
26-23	Me	Ph	Me	H	H	H	Me
26-24	Me	Ph	Me	Ph	H	H	H
26-25	Me	Ph	Me	H	Ph	H	H
26-26	Me	Ph	Me	H	H	Ph	H
26-27	Me	Ph	Me	H	H	H	Ph
26-28	Ph	Ph	Me	H	H	H	H
26-29	Ph	Ph	Me	Me	H	H	H
26-30	Ph	Ph	Me	H	Me	H	H
26-31	Ph	Ph	Me	H	H	Me	H
26-32	Ph	Ph	Me	H	H	H	Me
26-33	Ph	Ph	Me	Ph	H	H	H
26-34	Ph	Ph	Me	H	Ph	H	H
26-35	Ph	Ph	Me	H	H	Ph	H
26-36	Ph	Ph	Me	H	H	H	Ph

TABLE 26-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4
26-37	Me	Me	Ph	H	H	H	H
26-38	Me	Me	Ph	Me	H	H	H
26-39	Me	Me	Ph	H	Me	H	H
26-40	Me	Me	Ph	H	H	Me	H
26-41	Me	Me	Ph	H	H	H	Me
26-42	Me	Me	Ph	Ph	H	H	H
26-43	Me	Me	Ph	H	Ph	H	H
26-44	Me	Me	Ph	H	H	Ph	H
26-45	Me	Me	Ph	H	H	H	Ph
26-46	Ph	Me	Ph	H	H	H	H
26-47	Ph	Me	Ph	Me	H	H	H
26-48	Ph	Me	Ph	H	Me	H	H
26-49	Ph	Me	Ph	H	H	Me	H
26-50	Ph	Me	Ph	H	H	H	Me
26-51	Ph	Me	Ph	Ph	H	H	H
26-52	Ph	Me	Ph	H	Ph	H	H
26-53	Ph	Me	Ph	H	H	Ph	H
26-54	Ph	Me	Ph	H	H	H	Ph
26-55	Me	Ph	Ph	H	H	H	H
26-56	Me	Ph	Ph	Me	H	H	H
26-57	Me	Ph	Ph	H	Me	H	H
26-58	Me	Ph	Ph	H	H	Me	H
26-59	Me	Ph	Ph	H	H	H	Me
26-60	Me	Ph	Ph	Ph	H	H	H
26-61	Me	Ph	Ph	H	Ph	H	H
26-62	Me	Ph	Ph	H	H	Ph	H
26-63	Me	Ph	Ph	H	H	H	Ph
26-64	Ph	Ph	Ph	H	H	H	H
26-65	Ph	Ph	Ph	Me	H	H	H
26-66	Ph	Ph	Ph	H	Me	H	H
26-67	Ph	Ph	Ph	H	H	Me	H
26-68	Ph	Ph	Ph	H	H	H	Me
26-69	Ph	Ph	Ph	Ph	H	H	H
26-70	Ph	Ph	Ph	H	Ph	H	H
26-71	Ph	Ph	Ph	H	H	Ph	H
26-72	Ph	Ph	Ph	H	H	H	Ph

TABLE 27

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5
27-1	Me	Me	Me	H	H	H	H	Me
27-2	Me	Me	Me	Me	H	H	H	Me
27-3	Me	Me	Me	H	Me	H	H	Me
27-4	Me	Me	Me	H	H	Me	H	Me
27-5	Me	Me	Me	H	H	H	Me	Me
27-6	Me	Me	Me	Ph	H	H	H	Me
27-7	Me	Me	Me	H	Ph	H	H	Me
27-8	Me	Me	Me	H	H	Ph	H	Me
27-9	Me	Me	Me	H	H	H	Ph	Me
27-10	Ph	Me	Me	H	H	H	H	Me
27-11	Ph	Me	Me	Me	H	H	H	Me
27-12	Ph	Me	Me	H	Me	H	H	Me
27-13	Ph	Me	Me	H	H	Me	H	Me
27-14	Ph	Me	Me	H	H	H	Me	Me
27-15	Ph	Me	Me	Ph	H	H	H	Me
27-16	Ph	Me	Me	H	Ph	H	H	Me
27-17	Ph	Me	Me	H	H	Ph	H	Me
27-18	Ph	Me	Me	H	H	H	Ph	Me
27-19	Me	Ph	Me	H	H	H	H	Me
27-20	Me	Ph	Me	Me	H	H	H	Me
27-21	Me	Ph	Me	H	Me	H	H	Me
27-22	Me	Ph	Me	H	H	Me	H	Me
27-23	Me	Ph	Me	H	H	H	Me	Me
27-24	Me	Ph	Me	Ph	H	H	H	Me
27-25	Me	Ph	Me	H	Ph	H	H	Me
27-26	Me	Ph	Me	H	H	Ph	H	Me
27-27	Me	Ph	Me	H	H	H	Ph	Me
27-28	Ph	Ph	Me	H	H	H	H	Me
27-29	Ph	Ph	Me	Me	H	H	H	Me
27-30	Ph	Ph	Me	H	Me	H	H	Me
27-31	Ph	Ph	Me	H	H	Me	H	Me
27-32	Ph	Ph	Me	H	H	H	Me	Me
27-33	Ph	Ph	Me	Ph	H	H	H	Me
27-34	Ph	Ph	Me	H	Ph	H	H	Me

TABLE 27-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5
27-35	Ph	Ph	Me	H	H	Ph	H	Me
27-36	Ph	Ph	Me	H	H	H	Ph	Me
27-37	Me	Me	Ph	H	H	H	H	Me
27-38	Me	Me	Ph	Me	H	H	H	Me
27-39	Me	Me	Ph	H	Me	H	H	Me
27-40	Me	Me	Ph	H	H	Me	H	Me
27-41	Me	Me	Ph	H	H	H	Me	Me
27-42	Me	Me	Ph	Ph	H	H	H	Me
27-43	Me	Me	Ph	H	Ph	H	H	Me
27-44	Me	Me	Ph	H	H	Ph	H	Me
27-45	Me	Me	Ph	H	H	H	Ph	Me
27-46	Ph	Me	Ph	H	H	H	H	Me
27-47	Ph	Me	Ph	Me	H	H	H	Me
27-48	Ph	Me	Ph	H	Me	H	H	Me
27-49	Ph	Me	Ph	H	H	Me	H	Me
27-50	Ph	Me	Ph	H	H	H	Me	Me
27-51	Ph	Me	Ph	Ph	H	H	H	Me
27-52	Ph	Me	Ph	H	Ph	H	H	Me
27-53	Ph	Me	Ph	H	H	Ph	H	Me
27-54	Ph	Me	Ph	H	H	H	Ph	Me
27-55	Me	Ph	Ph	H	H	H	H	Me
27-56	Me	Ph	Ph	Me	H	H	H	Me
27-57	Me	Ph	Ph	H	Me	H	H	Me
27-58	Me	Ph	Ph	H	H	Me	H	Me
27-59	Me	Ph	Ph	H	H	H	Me	Me
27-60	Me	Ph	Ph	Ph	H	H	H	Me
27-61	Me	Ph	Ph	H	Ph	H	H	Me
27-62	Me	Ph	Ph	H	H	Ph	H	Me
27-63	Me	Ph	Ph	H	H	H	Ph	Me
27-64	Ph	Ph	Ph	H	H	H	H	Me
27-65	Ph	Ph	Ph	Me	H	H	H	Me
27-66	Ph	Ph	Ph	H	Me	H	H	Me
27-67	Ph	Ph	Ph	H	H	Me	H	Me
27-68	Ph	Ph	Ph	H	H	H	Me	Me
27-69	Ph	Ph	Ph	Ph	H	H	H	Me
27-70	Ph	Ph	Ph	H	Ph	H	H	Me
27-71	Ph	Ph	Ph	H	H	Ph	H	Me
27-72	Ph	Ph	Ph	H	H	H	Ph	Me

TABLE 28

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
28-1	Me	Me	Me	H	H	H	H	H	H
28-2	Me	Me	Me	Me	H	H	H	H	H
28-3	Me	Me	Me	H	Me	H	H	H	H
28-4	Me	Me	Me	H	H	Me	H	H	H
28-5	Me	Me	Me	H	H	H	Me	H	H
28-6	Me	Me	Me	H	H	H	H	Me	H
28-7	Me	Me	Me	H	H	H	H	H	Me
28-8	Me	Me	Me	Ph	H	H	H	H	H
28-9	Me	Me	Me	H	Ph	H	H	H	H
28-10	Me	Me	Me	H	H	Ph	H	H	H
28-11	Me	Me	Me	H	H	H	Ph	H	H
28-12	Me	Me	Me	H	H	H	H	Ph	H
28-13	Me	Me	Me	H	H	H	H	H	Ph
28-14	Ph	Me	Me	H	H	H	H	H	H
28-15	Ph	Me	Me	Me	H	H	H	H	H
28-16	Ph	Me	Me	H	Me	H	H	H	H
28-17	Ph	Me	Me	H	H	Me	H	H	H
28-18	Ph	Me	Me	H	H	H	Me	H	H
28-19	Ph	Me	Me	H	H	H	H	Me	H
28-20	Ph	Me	Me	H	H	H	H	H	Me
28-21	Ph	Me	Me	Ph	H	H	H	H	H
28-22	Ph	Me	Me	H	Ph	H	H	H	H
28-23	Ph	Me	Me	H	H	Ph	H	H	H
28-24	Ph	Me	Me	H	H	H	Ph	H	H
28-25	Ph	Me	Me	H	H	H	H	Ph	H
28-26	Ph	Me	Me	H	H	H	H	H	Ph
28-27	Me	Ph	Me	H	H	H	H	H	H
28-28	Me	Ph	Me	Me	H	H	H	H	H
28-29	Me	Ph	Me	H	Me	H	H	H	H
28-30	Me	Ph	Me	H	H	Me	H	H	H
28-31	Me	Ph	Me	H	H	H	Me	H	H

TABLE 28-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
28-32	Me	Ph	Me	H	H	H	H	Me	H
28-33	Me	Ph	Me	H	H	H	H	H	Me
28-34	Me	Ph	Me	Ph	H	H	H	H	H
28-35	Me	Ph	Me	H	Ph	H	H	H	H
28-36	Me	Ph	Me	H	H	Ph	H	H	H
28-37	Me	Ph	Me	H	H	H	Ph	H	H
28-38	Me	Ph	Me	H	H	H	H	Ph	H
28-39	Me	Ph	Me	H	H	H	H	H	Ph
28-40	Ph	Ph	Me	H	H	H	H	H	H
28-41	Ph	Ph	Me	Me	H	H	H	H	H
28-42	Ph	Ph	Me	H	Me	H	H	H	H
28-43	Ph	Ph	Me	H	H	Me	H	H	H
28-44	Ph	Ph	Me	H	H	H	Me	H	H
28-45	Ph	Ph	Me	H	H	H	H	Me	H
28-46	Ph	Ph	Me	H	H	H	H	H	Me
28-47	Ph	Ph	Me	Ph	H	H	H	H	H
28-48	Ph	Ph	Me	H	Ph	H	H	H	H
28-49	Ph	Ph	Me	H	H	Ph	H	H	H
28-50	Ph	Ph	Me	H	H	H	Ph	H	H
28-51	Ph	Ph	Me	H	H	H	H	Ph	H
28-52	Ph	Ph	Me	H	H	H	H	H	Ph
28-53	Me	Me	Ph	H	H	H	H	H	H
28-54	Me	Me	Ph	Me	H	H	H	H	H
28-55	Me	Me	Ph	H	Me	H	H	H	H
28-56	Me	Me	Ph	H	H	Me	H	H	H
28-57	Me	Me	Ph	H	H	H	Me	H	H
28-58	Me	Me	Ph	H	H	H	H	Me	H
28-59	Me	Me	Ph	H	H	H	H	H	Me
28-60	Me	Me	Ph	Ph	H	H	H	H	H
28-61	Me	Me	Ph	H	Ph	H	H	H	H
28-62	Me	Me	Ph	H	H	Ph	H	H	H
28-63	Me	Me	Ph	H	H	H	Ph	H	H
28-64	Me	Me	Ph	H	H	H	H	Ph	H
28-65	Me	Me	Ph	H	H	H	H	H	Ph
28-66	Ph	Me	Ph	H	H	H	H	H	H
28-67	Ph	Me	Ph	Me	H	H	H	H	H
28-68	Ph	Me	Ph	H	Me	H	H	H	H
28-69	Ph	Me	Ph	H	H	Me	H	H	H
28-70	Ph	Me	Ph	H	H	H	Me	H	H
28-71	Ph	Me	Ph	H	H	H	H	Me	H
28-72	Ph	Me	Ph	H	H	H	H	H	Me
28-73	Ph	Me	Ph	Ph	H	H	H	H	H
28-74	Ph	Me	Ph	H	Ph	H	H	H	H
28-75	Ph	Me	Ph	H	H	Ph	H	H	H
28-76	Ph	Me	Ph	H	H	H	Ph	H	H
28-77	Ph	Me	Ph	H	H	H	H	Ph	H
28-78	Ph	Me	Ph	H	H	H	H	H	Ph
28-79	Me	Ph	Ph	H	H	H	H	H	H
28-80	Me	Ph	Ph	Me	H	H	H	H	H
28-81	Me	Ph	Ph	H	Me	H	H	H	H
28-82	Me	Ph	Ph	H	H	Me	H	H	H
28-83	Me	Ph	Ph	H	H	H	Me	H	H
28-84	Me	Ph	Ph	H	H	H	H	Me	H
28-85	Me	Ph	Ph	H	H	H	H	H	Me
28-86	Me	Ph	Ph	Ph	H	H	H	H	H
28-87	Me	Ph	Ph	H	Ph	H	H	H	H
28-88	Me	Ph	Ph	H	H	Ph	H	H	H
28-89	Me	Ph	Ph	H	H	H	Ph	H	H
28-90	Me	Ph	Ph	H	H	H	H	Ph	H
28-91	Me	Ph	Ph	H	H	H	H	H	Ph
28-92	Ph	Ph	Ph	H	H	H	H	H	H
28-93	Ph	Ph	Ph	Me	H	H	H	H	H
28-94	Ph	Ph	Ph	H	Me	H	H	H	H
28-95	Ph	Ph	Ph	H	H	Me	H	H	H
28-96	Ph	Ph	Ph	H	H	H	Me	H	H
28-97	Ph	Ph	Ph	H	H	H	H	Me	H
28-98	Ph	Ph	Ph	H	H	H	H	H	Me
28-99	Ph	Ph	Ph	Ph	H	H	H	H	H
28-100	Ph	Ph	Ph	H	Ph	H	H	H	H
28-101	Ph	Ph	Ph	H	H	Ph	H	H	H
28-102	Ph	Ph	Ph	H	H	H	Ph	H	H
28-103	Ph	Ph	Ph	H	H	H	H	Ph	H
28-104	Ph	Ph	Ph	H	H	H	H	H	Ph

TABLE 29

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
29-1	Me	Me	Me	H	H	H	H	H	H	H
29-2	Me	Me	Me	Me	H	H	H	H	H	H
29-3	Me	Me	Me	H	Me	H	H	H	H	H
29-4	Me	Me	Me	H	H	Me	H	H	H	H
29-5	Me	Me	Me	H	H	H	Me	H	H	H
29-6	Me	Me	Me	H	H	H	H	Me	H	H
29-7	Me	Me	Me	H	H	H	H	H	Me	H
29-8	Me	Me	Me	H	H	H	H	H	H	Me
29-9	Me	Me	Me	Ph	H	H	H	H	H	H
29-10	Me	Me	Me	H	Ph	H	H	H	H	H
29-11	Me	Me	Me	H	H	Ph	H	H	H	H
29-12	Me	Me	Me	H	H	H	Ph	H	H	H
29-13	Me	Me	Me	H	H	H	H	Ph	H	H
29-14	Me	Me	Me	H	H	H	H	H	Ph	H
29-15	Ph	Me	Me	H	H	H	H	H	H	Ph
29-16	Ph	Me	Me	H	H	H	H	H	H	H
29-17	Ph	Me	Me	Me	H	H	H	H	H	H
29-18	Ph	Me	Me	H	Me	H	H	H	H	H
29-19	Ph	Me	Me	H	H	Me	H	H	H	H
29-20	Ph	Me	Me	H	H	H	Me	H	H	H
29-21	Ph	Me	Me	H	H	H	H	Me	H	H
29-22	Ph	Me	Me	H	H	H	H	H	Me	H
29-23	Ph	Me	Me	H	H	H	H	H	H	Me
29-24	Ph	Me	Me	Ph	H	H	H	H	H	H
29-25	Ph	Me	Me	H	Ph	H	H	H	H	H
29-26	Ph	Me	Me	H	H	Ph	H	H	H	H
29-27	Ph	Me	Me	H	H	H	Ph	H	H	H
29-28	Ph	Me	Me	H	H	H	H	Ph	H	H
29-29	Ph	Me	Me	H	H	H	H	H	Ph	H
29-30	Ph	Me	Me	H	H	H	H	H	H	Ph
29-31	Me	Ph	Me	H	H	H	H	H	H	H
29-32	Me	Ph	Me	Me	H	H	H	H	H	H
29-33	Me	Ph	Me	H	Me	H	H	H	H	H
29-34	Me	Ph	Me	H	H	Me	H	H	H	H
29-35	Me	Ph	Me	H	H	H	Me	H	H	H
29-36	Me	Ph	Me	H	H	H	H	Me	H	H
29-37	Me	Ph	Me	H	H	H	H	H	Me	H
29-38	Me	Ph	Me	H	H	H	H	H	H	Me
29-39	Me	Ph	Me	Ph	H	H	H	H	H	H
29-40	Me	Ph	Me	H	Ph	H	H	H	H	H
29-41	Me	Ph	Me	H	H	Ph	H	H	H	H
29-42	Me	Ph	Me	H	H	H	Ph	H	H	H
29-43	Me	Ph	Me	H	H	H	H	Ph	H	H
29-44	Me	Ph	Me	H	H	H	H	H	Ph	H
29-45	Ph	Ph	Me	H	H	H	H	H	H	Ph
29-46	Ph	Ph	Me	H	H	H	H	H	H	H
29-47	Ph	Ph	Me	Me	H	H	H	H	H	H
29-48	Ph	Ph	Me	H	Me	H	H	H	H	H
29-49	Ph	Ph	Me	H	H	Me	H	H	H	H
29-50	Ph	Ph	Me	H	H	H	Me	H	H	H
29-51	Ph	Ph	Me	H	H	H	H	Me	H	H
29-52	Ph	Ph	Me	H	H	H	H	H	Me	H
29-53	Ph	Ph	Me	H	H	H	H	H	H	Me
29-54	Ph	Ph	Me	Ph	H	H	H	H	H	H
29-55	Ph	Ph	Me	H	Ph	H	H	H	H	H
29-56	Ph	Ph	Me	H	H	Ph	H	H	H	H
29-57	Ph	Ph	Me	H	H	H	Ph	H	H	H
29-58	Ph	Ph	Me	H	H	H	H	Ph	H	H
29-59	Ph	Ph	Me	H	H	H	H	H	Ph	H
29-60	Ph	Ph	Me	H	H	H	H	H	H	Ph
29-61	Me	Me	Ph	H	H	H	H	H	H	H
29-62	Me	Me	Ph	Me	H	H	H	H	H	H
29-63	Me	Me	Ph	H	Me	H	H	H	H	H
29-64	Me	Me	Ph	H	H	Me	H	H	H	H
29-65	Me	Me	Ph	H	H	H	Me	H	H	H
29-66	Me	Me	Ph	H	H	H	H	Me	H	H
29-67	Me	Me	Ph	H	H	H	H	H	Me	H
29-68	Me	Me	Ph	H	H	H	H	H	H	Me
29-69	Me	Me	Ph	Ph	H	H	H	H	H	H
29-70	Me	Me	Ph	H	Ph	H	H	H	H	H
29-71	Me	Me	Ph	H	H	Ph	H	H	H	H
29-72	Me	Me	Ph	H	H	H	Ph	H	H	H
29-73	Me	Me	Ph	H	H	H	H	Ph	H	H
29-74	Me	Me	Ph	H	H	H	H	H	Ph	H
29-75	Ph	Me	Ph	H	H	H	H	H	H	Ph
29-76	Ph	Me	Ph	H	H	H	H	H	H	H
29-77	Ph	Me	Ph	Me	H	H	H	H	H	H
29-78	Ph	Me	Ph	H	Me	H	H	H	H	H

^{1}H NMR of $(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_2Ir(t\text{-}Bu\text{-}bpy)^+$ in $CDCl_3$

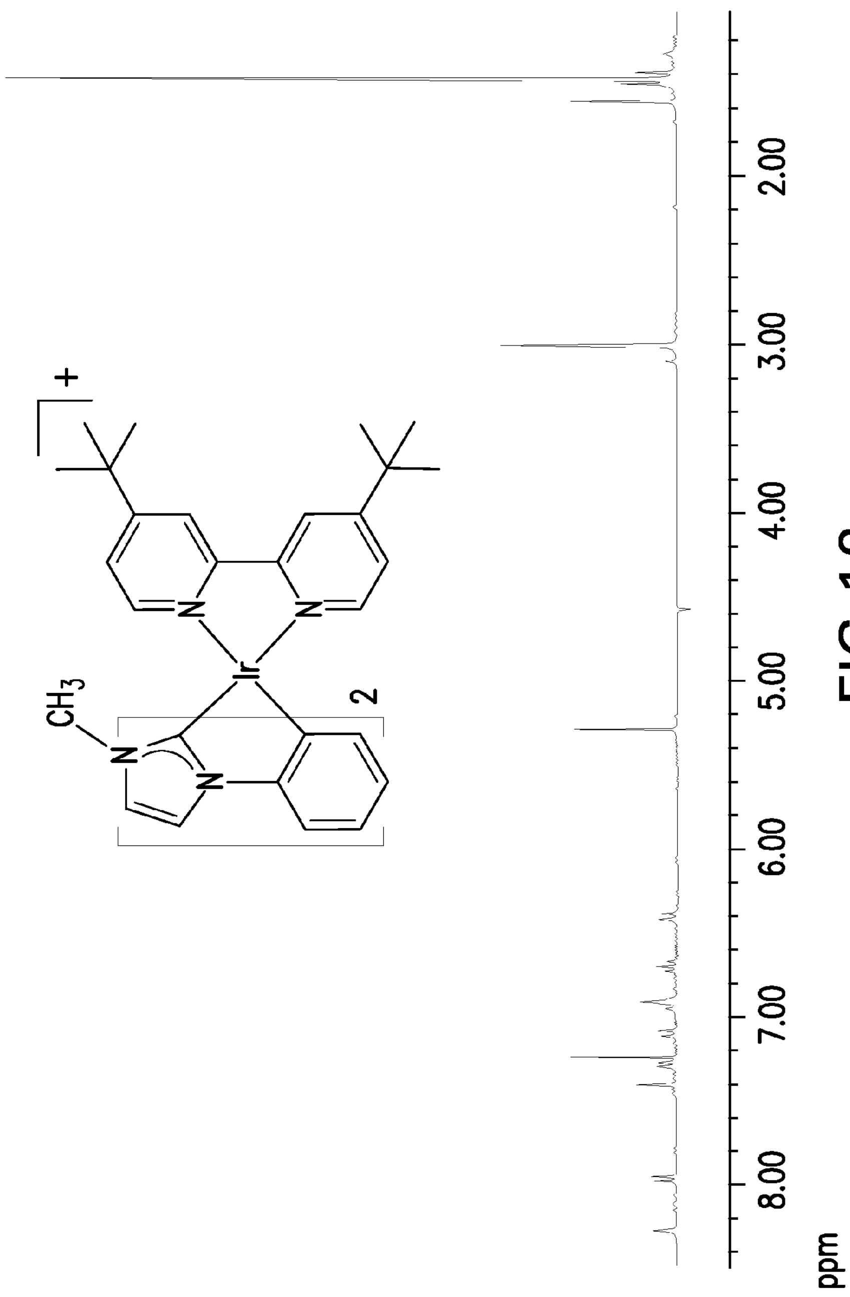


FIG. 12

TABLE 29-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
29-79	Ph	Me	Ph	H	H	Me	H	H	H	H
29-80	Ph	Me	Ph	H	H	H	Me	H	H	H
29-81	Ph	Me	Ph	H	H	H	H	Me	H	H
29-82	Ph	Me	Ph	H	H	H	H	H	Me	H
29-83	Ph	Me	Ph	H	H	H	H	H	H	Me
29-84	Ph	Me	Ph	Ph	H	H	H	H	H	H
29-85	Ph	Me	Ph	H	Ph	H	H	H	H	H
29-86	Ph	Me	Ph	H	H	Ph	H	H	H	H
29-87	Ph	Me	Ph	H	H	H	Ph	H	H	H
29-88	Ph	Me	Ph	H	H	H	H	Ph	H	H
29-89	Ph	Me	Ph	H	H	H	H	H	Ph	H
29-90	Ph	Me	Ph	H	H	H	H	H	H	Ph
29-91	Me	Ph	Ph	H	H	H	H	H	H	H
29-92	Me	Ph	Ph	Me	H	H	H	H	H	H
29-93	Me	Ph	Ph	H	Me	H	H	H	H	H
29-94	Me	Ph	Ph	H	H	Me	H	H	H	H
29-95	Me	Ph	Ph	H	H	H	Me	H	H	H
29-96	Me	Ph	Ph	H	H	H	H	Me	H	H
29-97	Me	Ph	Ph	H	H	H	H	H	Me	H
29-98	Me	Ph	Ph	H	H	H	H	H	H	Me
29-99	Me	Ph	Ph	Ph	H	H	H	H	H	H
29-100	Me	Ph	Ph	H	Ph	H	H	H	H	H
29-101	Me	Ph	Ph	H	H	Ph	H	H	H	H
29-102	Me	Ph	Ph	H	H	H	Ph	H	H	H
29-103	Me	Ph	Ph	H	H	H	H	Ph	H	H
29-104	Me	Ph	Ph	H	H	H	H	H	Ph	H
29-105	Ph	Ph	Ph	H	H	H	H	H	H	Ph
29-106	Ph	Ph	Ph	H	H	H	H	H	H	H
29-107	Ph	Ph	Ph	Me	H	H	H	H	H	H
29-108	Ph	Ph	Ph	H	Me	H	H	H	H	H
29-109	Ph	Ph	Ph	H	H	Me	H	H	H	H
29-110	Ph	Ph	Ph	H	H	H	Me	H	H	H
29-111	Ph	Ph	Ph	H	H	H	H	Me	H	H
29-112	Ph	Ph	Ph	H	H	H	H	H	Me	H
29-113	Ph	Ph	Ph	H	H	H	H	H	H	Me
29-114	Ph	Ph	Ph	Ph	H	H	H	H	H	H
29-115	Ph	Ph	Ph	H	Ph	H	H	H	H	H
29-116	Ph	Ph	Ph	H	H	Ph	H	H	H	H
29-117	Ph	Ph	Ph	H	H	H	Ph	H	H	H
29-118	Ph	Ph	Ph	H	H	H	H	Ph	H	H
29-119	Ph	Ph	Ph	H	H	H	H	H	Ph	H
29-120	Ph	Ph	Ph	H	H	H	H	H	H	Ph

TABLE 30

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
30-1	Me	Me	Me	H	H	H	H	H	H	H	H
30-2	Me	Me	Me	Me	H	H	H	H	H	H	H
30-3	Me	Me	Me	H	Me	H	H	H	H	H	H
30-4	Me	Me	Me	H	H	Me	H	H	H	H	H
30-5	Me	Me	Me	H	H	H	Me	H	H	H	H
30-6	Me	Me	Me	H	H	H	H	Me	H	H	H
30-7	Me	Me	Me	H	H	H	H	H	Me	H	H
30-8	Me	Me	Me	H	H	H	H	H	H	Me	H
30-9	Me	Me	Me	H	H	H	H	H	H	H	Me
30-10	Me	Me	Me	Ph	H	H	H	H	H	H	H
30-11	Me	Me	Me	H	Ph	H	H	H	H	H	H
30-12	Me	Me	Me	H	H	Ph	H	H	H	H	H
30-13	Me	Me	Me	H	H	H	Ph	H	H	H	H
30-14	Me	Me	Me	H	H	H	H	Ph	H	H	H
30-15	Me	Me	Me	H	H	H	H	H	Ph	H	H
30-16	Me	Me	Me	H	H	H	H	H	H	Ph	H
30-17	Me	Me	Me	H	H	H	H	H	H	H	Ph
30-18	Ph	Me	Me	H	H	H	H	H	H	H	H
30-19	Ph	Me	Me	Me	H	H	H	H	H	H	H
30-20	Ph	Me	Me	H	Me	H	H	H	H	H	H
30-21	Ph	Me	Me	H	H	Me	H	H	H	H	H
30-22	Ph	Me	Me	H	H	H	Me	H	H	H	H
30-23	Ph	Me	Me	H	H	H	H	Me	H	H	H
30-24	Ph	Me	Me	H	H	H	H	H	Me	H	H
30-25	Ph	Me	Me	H	H	H	H	H	H	Me	H
30-26	Ph	Me	Me	H	H	H	H	H	H	H	Me
30-27	Ph	Me	Me	Ph	H	H	H	H	H	H	H
30-28	Ph	Me	Me	H	Ph	H	H	H	H	H	H

TABLE 30-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
30-29	Ph	Me	Me	H	H	Ph	H	H	H	H	H
30-30	Ph	Me	Me	H	H	H	Ph	H	H	H	H
30-31	Ph	Me	Me	H	H	H	H	Ph	H	H	H
30-32	Ph	Me	Me	H	H	H	H	H	Ph	H	H
30-33	Ph	Me	Me	H	H	H	H	H	H	Ph	H
30-34	Ph	Me	Me	H	H	H	H	H	H	H	Ph
30-35	Me	Ph	Me	H	H	H	H	H	H	H	H
30-36	Me	Ph	Me	Me	H	H	H	H	H	H	H
30-37	Me	Ph	Me	H	Me	H	H	H	H	H	H
30-38	Me	Ph	Me	H	H	Me	H	H	H	H	H
30-39	Me	Ph	Me	H	H	H	Me	H	H	H	H
30-40	Me	Ph	Me	H	H	H	H	Me	H	H	H
30-41	Me	Ph	Me	H	H	H	H	H	Me	H	H
30-42	Me	Ph	Me	H	H	H	H	H	H	Me	H
30-43	Me	Ph	Me	H	H	H	H	H	H	H	Me
30-44	Me	Ph	Me	Ph	H	H	H	H	H	H	H
30-45	Me	Ph	Me	H	Ph	H	H	H	H	H	H
30-46	Me	Ph	Me	H	H	Ph	H	H	H	H	H
30-47	Me	Ph	Me	H	H	H	Ph	H	H	H	H
30-48	Me	Ph	Me	H	H	H	H	Ph	H	H	H
30-49	Me	Ph	Me	H	H	H	H	H	Ph	H	H
30-50	Me	Ph	Me	H	H	H	H	H	H	Ph	H
30-51	Me	Ph	Me	H	H	H	H	H	H	H	Ph
30-52	Ph	Ph	Me	H	H	H	H	H	H	H	H
30-53	Ph	Ph	Me	Me	H	H	H	H	H	H	H
30-54	Ph	Ph	Me	H	Me	H	H	H	H	H	H
30-55	Ph	Ph	Me	H	H	Me	H	H	H	H	H
30-56	Ph	Ph	Me	H	H	H	Me	H	H	H	H
30-57	Ph	Ph	Me	H	H	H	H	Me	H	H	H
30-58	Ph	Ph	Me	H	H	H	H	H	Me	H	H
30-59	Ph	Ph	Me	H	H	H	H	H	H	Me	H
30-60	Ph	Ph	Me	H	H	H	H	H	H	H	Me
30-61	Ph	Ph	Me	Ph	H	H	H	H	H	H	H
30-62	Ph	Ph	Me	H	Ph	H	H	H	H	H	H
30-63	Ph	Ph	Me	H	H	Ph	H	H	H	H	H
30-64	Ph	Ph	Me	H	H	H	Ph	H	H	H	H
30-65	Ph	Ph	Me	H	H	H	H	Ph	H	H	H
30-66	Ph	Ph	Me	H	H	H	H	H	Ph	H	H
30-67	Ph	Ph	Me	H	H	H	H	H	H	Ph	H
30-68	Ph	Ph	Me	H	H	H	H	H	H	H	Ph
30-69	Me	Me	Ph	H	H	H	H	H	H	H	H
30-70	Me	Me	Ph	Me	H	H	H	H	H	H	H
30-71	Me	Me	Ph	H	Me	H	H	H	H	H	H
30-72	Me	Me	Ph	H	H	Me	H	H	H	H	H
30-73	Me	Me	Ph	H	H	H	Me	H	H	H	H
30-74	Me	Me	Ph	H	H	H	H	Me	H	H	H
30-75	Me	Me	Ph	H	H	H	H	H	Me	H	H
30-76	Me	Me	Ph	H	H	H	H	H	H	Me	H
30-77	Me	Me	Ph	H	H	H	H	H	H	H	Me
30-78	Me	Me	Ph	Ph	H	H	H	H	H	H	H
30-79	Me	Me	Ph	H	Ph	H	H	H	H	H	H
30-80	Me	Me	Ph	H	H	Ph	H	H	H	H	H
30-81	Me	Me	Ph	H	H	H	Ph	H	H	H	H
30-82	Me	Me	Ph	H	H	H	H	Ph	H	H	H
30-83	Me	Me	Ph	H	H	H	H	H	Ph	H	H
30-84	Me	Me	Ph	H	H	H	H	H	H	Ph	H
30-85	Me	Me	Ph	H	H	H	H	H	H	H	Ph
30-86	Ph	Me	Ph	H	H	H	H	H	H	H	H
30-87	Ph	Me	Ph	Me	H	H	H	H	H	H	H
30-88	Ph	Me	Ph	H	Me	H	H	H	H	H	H
30-89	Ph	Me	Ph	H	H	Me	H	H	H	H	H
30-90	Ph	Me	Ph	H	H	H	Me	H	H	H	H
30-91	Ph	Me	Ph	H	H	H	H	Me	H	H	H
30-92	Ph	Me	Ph	H	H	H	H	H	Me	H	H
30-93	Ph	Me	Ph	H	H	H	H	H	H	Me	H
30-94	Ph	Me	Ph	H	H	H	H	H	H	H	Me
30-95	Ph	Me	Ph	Ph	H	H	H	H	H	H	H
30-96	Ph	Me	Ph	H	Ph	H	H	H	H	H	H
30-97	Ph	Me	Ph	H	H	Ph	H	H	H	H	H
30-98	Ph	Me	Ph	H	H	H	Ph	H	H	H	H
30-99	Ph	Me	Ph	H	H	H	H	Ph	H	H	H
30-100	Ph	Me	Ph	H	H	H	H	H	Ph	H	H
30-101	Ph	Me	Ph	H	H	H	H	H	H	Ph	H
30-102	Ph	Me	Ph	H	H	H	H	H	H	H	Ph
30-103	Me	Ph	Ph	H	H	H	H	H	H	H	H
30-104	Me	Ph	Ph	Me	H	H	H	H	H	H	H
30-105	Me	Ph	Ph	H	Me	H	H	H	H	H	H
30-106	Me	Ph	Ph	H	H	Me	H	H	H	H	H

TABLE 30-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
30-107	Me	Ph	Ph	H	H	H	Me	H	H	H	H
30-108	Me	Ph	Ph	H	H	H	H	Me	H	H	H
30-109	Me	Ph	Ph	H	H	H	H	H	Me	H	H
30-110	Me	Ph	Ph	H	H	H	H	H	H	Me	H
30-111	Me	Ph	Ph	H	H	H	H	H	H	H	Me
30-112	Me	Ph	Ph	Ph	H	H	H	H	H	H	H
30-113	Me	Ph	Ph	H	Ph	H	H	H	H	H	H
30-114	Me	Ph	Ph	H	H	Ph	H	H	H	H	H
30-115	Me	Ph	Ph	H	H	H	Ph	H	H	H	H
30-116	Me	Ph	Ph	H	H	H	H	Ph	H	H	H
30-117	Me	Ph	Ph	H	H	H	H	H	Ph	H	H
30-118	Me	Ph	Ph	H	H	H	H	H	H	Ph	H
30-119	Me	Ph	Ph	H	H	H	H	H	H	H	Ph
30-120	Ph	Ph	Ph	H	H	H	H	H	H	H	H
30-121	Ph	Ph	Ph	Me	H	H	H	H	H	H	H
30-122	Ph	Ph	Ph	H	Me	H	H	H	H	H	H
30-123	Ph	Ph	Ph	H	H	Me	H	H	H	H	H
30-124	Ph	Ph	Ph	H	H	H	Me	H	H	H	H
30-125	Ph	Ph	Ph	H	H	H	H	Me	H	H	H
30-126	Ph	Ph	Ph	H	H	H	H	H	Me	H	H
30-127	Ph	Ph	Ph	H	H	H	H	H	H	Me	H
30-128	Ph	Ph	Ph	H	H	H	H	H	H	H	Me
30-129	Ph	Ph	Ph	Ph	H	H	H	H	H	H	H
30-130	Ph	Ph	Ph	H	Ph	H	H	H	H	H	H
30-131	Ph	Ph	Ph	H	H	Ph	H	H	H	H	H
30-132	Ph	Ph	Ph	H	H	H	Ph	H	H	H	H
30-133	Ph	Ph	Ph	H	H	H	H	Ph	H	H	H
30-134	Ph	Ph	Ph	H	H	H	H	H	Ph	H	H
30-135	Ph	Ph	Ph	H	H	H	H	H	H	Ph	H
30-136	Ph	Ph	Ph	H	H	H	H	H	H	H	Ph

TABLE 31

Cpd No.	Ra1	Ra2	Rb1	Rb2	Rb3	Rb4	Rb5
31-1	Me	H	H	H	H	H	H
31-2	Me	H	Me	H	H	H	H
31-3	Me	H	H	Me	H	H	H
31-4	Me	H	H	H	Me	H	H
31-5	Me	H	H	H	H	Me	H
31-6	Me	H	H	H	H	H	Me
31-7	Me	H	Ph	H	H	H	H
31-8	Me	H	H	Ph	H	H	H
31-9	Me	H	H	H	Ph	H	H
31-10	Me	H	H	H	H	Ph	H
31-11	Me	H	H	H	H	H	Ph
31-12	Ph	H	H	H	H	H	H
31-13	Ph	H	Me	H	H	H	H
31-14	Ph	H	H	Me	H	H	H
31-15	Ph	H	H	H	Me	H	H
31-16	Ph	H	H	H	H	Me	H
31-17	Ph	H	H	H	H	H	Me
31-18	Ph	H	Ph	H	H	H	H
31-19	Ph	H	H	Ph	H	H	H
31-20	Ph	H	H	H	Ph	H	H
31-21	Ph	H	H	H	H	Ph	H
31-22	Ph	H	H	H	H	H	Ph
31-23	Me	Me	H	H	H	H	H
31-24	Me	Me	Me	H	H	H	H
31-25	Me	Me	H	Me	H	H	H
31-26	Me	Me	H	H	Me	H	H
31-27	Me	Me	H	H	H	Me	H
31-28	Me	Me	H	H	H	H	Me
31-29	Me	Me	Ph	H	H	H	H
31-30	Me	Me	H	Ph	H	H	H
31-31	Me	Me	H	H	Ph	H	H
31-32	Me	Me	H	H	H	Ph	H
31-33	Me	Me	H	H	H	H	Ph
31-34	Ph	Me	H	H	H	H	H
31-35	Ph	Me	Me	H	H	H	H
31-36	Ph	Me	H	Me	H	H	H
31-37	Ph	Me	H	H	Me	H	H
31-38	Ph	Me	H	H	H	Me	H
31-39	Ph	Me	H	H	H	H	Me
31-40	Ph	Me	Ph	H	H	H	H

TABLE 31-continued

Cpd No.	Ra1	Ra2	Rb1	Rb2	Rb3	Rb4	Rb5
31-41	Ph	Me	H	Ph	H	H	H
31-42	Ph	Me	H	H	Ph	H	H
31-43	Ph	Me	H	H	H	Ph	H
31-44	Ph	Me	H	H	H	H	Ph
31-45	Me	Ph	H	H	H	H	H
31-46	Me	Ph	Me	H	H	H	H
31-47	Me	Ph	H	Me	H	H	H
31-48	Me	Ph	H	H	Me	H	H
31-49	Me	Ph	H	H	H	Me	H
31-50	Me	Ph	H	H	H	H	Me
31-51	Me	Ph	Ph	H	H	H	H
31-52	Me	Ph	H	Ph	H	H	H
31-53	Me	Ph	H	H	Ph	H	H
31-54	Me	Ph	H	H	H	Ph	H
31-55	Me	Ph	H	H	H	H	Ph
31-56	Ph	Ph	H	H	H	H	H
31-57	Ph	Ph	Me	H	H	H	H
31-58	Ph	Ph	H	Me	H	H	H
31-59	Ph	Ph	H	H	Me	H	H
31-60	Ph	Ph	H	H	H	Me	H
31-61	Ph	Ph	H	H	H	H	Me
31-62	Ph	Ph	Ph	H	H	H	H
31-63	Ph	Ph	H	Ph	H	H	H
31-64	Ph	Ph	H	H	Ph	H	H
31-65	Ph	Ph	H	H	H	Ph	H
31-66	Ph	Ph	H	H	H	H	Ph

TABLE 32

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5
32-1	H	H	H	H	H	H	H	H
32-2	H	H	H	Me	H	H	H	H
32-3	H	H	H	H	Me	H	H	H
32-4	H	H	H	H	H	Me	H	H
32-5	H	H	H	H	H	H	Me	H
32-6	H	H	H	H	H	H	H	Me
32-7	H	H	H	Ph	H	H	H	H

TABLE 32-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5
32-8	H	H	H	H	Ph	H	H	H
32-9	H	H	H	H	H	Ph	H	H
32-10	H	H	H	H	H	H	Ph	H
32-11	H	H	H	H	H	H	H	Ph
32-12	Me	H	H	H	H	H	H	H
32-13	Me	H	H	Me	H	H	H	H
32-14	Me	H	H	H	Me	H	H	H
32-15	Me	H	H	H	H	Me	H	H
32-16	Me	H	H	H	H	H	Me	H
32-17	Me	H	H	H	H	H	H	Me
32-18	Me	H	H	Ph	H	H	H	H
32-19	Me	H	H	H	Ph	H	H	H
32-20	Me	H	H	H	H	Ph	H	H
32-21	Me	H	H	H	H	H	Ph	H
32-22	Me	H	H	H	H	H	H	Ph
32-23	H	Me	H	H	H	H	H	H
32-24	H	Me	H	Me	H	H	H	H
32-25	H	Me	H	H	Me	H	H	H
32-26	H	Me	H	H	H	Me	H	H
32-27	H	Me	H	H	H	H	Me	H
32-28	H	Me	H	H	H	H	H	Me
32-29	H	Me	H	Ph	H	H	H	H
32-30	H	Me	H	H	Ph	H	H	H
32-31	H	Me	H	H	H	Ph	H	H
32-32	H	Me	H	H	H	H	Ph	H
32-33	H	Me	H	H	H	H	H	Ph
32-34	H	H	Me	H	H	H	H	H
32-35	H	H	Me	Me	H	H	H	H
32-36	H	H	Me	H	Me	H	H	H
32-37	H	H	Me	H	H	Me	H	H
32-38	H	H	Me	H	H	H	Me	H
32-39	H	H	Me	H	H	H	H	Me
32-40	H	H	Me	Ph	H	H	H	H
32-41	H	H	Me	H	Ph	H	H	H
32-42	H	H	Me	H	H	Ph	H	H
32-43	H	H	Me	H	H	H	Ph	H
32-44	H	H	Me	H	H	H	H	Ph
32-45	Ph	H	H	H	H	H	H	H
32-46	Ph	H	H	Me	H	H	H	H
32-47	Ph	H	H	H	Me	H	H	H
32-48	Ph	H	H	H	H	Me	H	H
32-49	Ph	H	H	H	H	H	Me	H
32-50	Ph	H	H	H	H	H	H	Me
32-51	Ph	H	H	Ph	H	H	H	H
32-52	Ph	H	H	H	Ph	H	H	H
32-53	Ph	H	H	H	H	Ph	H	H
32-54	Ph	H	H	H	H	H	Ph	H
32-55	Ph	H	H	H	H	H	H	Ph
32-56	H	Ph	H	H	H	H	H	H
32-57	H	Ph	H	Me	H	H	H	H
32-58	H	Ph	H	H	Me	H	H	H
32-59	H	Ph	H	H	H	Me	H	H
32-60	H	Ph	H	H	H	H	Me	H
32-61	H	Ph	H	H	H	H	H	Me
32-62	H	Ph	H	Ph	H	H	H	H
32-63	H	Ph	H	H	Ph	H	H	H
32-64	H	Ph	H	H	H	Ph	H	H
32-65	H	Ph	H	H	H	H	Ph	H
32-66	H	Ph	H	H	H	H	H	Ph
32-67	H	H	Ph	H	H	H	H	H
32-68	H	H	Ph	Me	H	H	H	H
32-69	H	H	Ph	H	Me	H	H	H
32-70	H	H	Ph	H	H	Me	H	H
32-71	H	H	Ph	H	H	H	Me	H
32-72	H	H	Ph	H	H	H	H	Me
32-73	H	H	Ph	Ph	H	H	H	H
32-74	H	H	Ph	H	Ph	H	H	H
32-75	H	H	Ph	H	H	Ph	H	H
32-76	H	H	Ph	H	H	H	Ph	H
32-77	H	H	Ph	H	H	H	H	Ph

TABLE 33

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
33-1	Me	H	H	H	H	H	H	H	H	Me	Me
33-2	Me	H	H	Me	H	H	H	H	H	Me	Me
33-3	Me	H	H	H	Me	H	H	H	H	Me	Me
33-4	Me	H	H	H	H	Me	H	H	H	Me	Me
33-5	Me	H	H	H	H	H	Me	H	H	Me	Me
33-6	Me	H	H	H	H	H	H	Me	H	Me	Me
33-7	Me	H	H	H	H	H	H	H	Me	Me	Me
33-8	Me	H	H	Ph	H	H	H	H	H	Me	Me
33-9	Me	H	H	H	Ph	H	H	H	H	Me	Me
33-10	Me	H	H	H	H	Ph	H	H	H	Me	Me
33-11	Me	H	H	H	H	H	Ph	H	H	Me	Me
33-12	Me	H	H	H	H	H	H	Ph	H	Me	Me
33-13	Me	H	H	H	H	H	H	H	Ph	Me	Me
33-14	Ph	H	H	H	H	H	H	H	H	Me	Me
33-15	Ph	H	H	Me	H	H	H	H	H	Me	Me
33-16	Ph	H	H	H	Me	H	H	H	H	Me	Me
33-17	Ph	H	H	H	H	Me	H	H	H	Me	Me
33-18	Ph	H	H	H	H	H	Me	H	H	Me	Me
33-19	Ph	H	H	H	H	H	H	Me	H	Me	Me
33-20	Ph	H	H	H	H	H	H	H	Me	Me	Me
33-21	Ph	H	H	Ph	H	H	H	H	H	Me	Me
33-22	Ph	H	H	H	Ph	H	H	H	H	Me	Me
33-23	Ph	H	H	H	H	Ph	H	H	H	Me	Me
33-24	Ph	H	H	H	H	H	Ph	H	H	Me	Me
33-25	Ph	H	H	H	H	H	H	Ph	H	Me	Me
33-26	Ph	H	H	H	H	H	H	H	Ph	Me	Me
33-27	Me	Me	H	H	H	H	H	H	H	Me	Me
33-28	Me	Me	H	Me	H	H	H	H	H	Me	Me
33-29	Me	Me	H	H	Me	H	H	H	H	Me	Me
33-30	Me	Me	H	H	H	Me	H	H	H	Me	Me
33-31	Me	Me	H	H	H	H	Me	H	H	Me	Me
33-32	Me	Me	H	H	H	H	H	Me	H	Me	Me
33-33	Me	Me	H	H	H	H	H	H	Me	Me	Me
33-34	Me	Me	H	Ph	H	H	H	H	H	Me	Me
33-35	Me	Me	H	H	Ph	H	H	H	H	Me	Me

TABLE 33-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
33-36	Me	Me	H	H	H	Ph	H	H	H	Me	Me
33-37	Me	Me	H	1-I	H	H	Ph	H	H	Me	Me
33-38	Me	Me	H	H	H	H	H	Ph	H	Me	Me
33-39	Me	Me	H	H	H	H	H	H	Ph	Me	Me
33-40	Ph	Me	H	H	H	H	H	H	H	Me	Me
33-41	Ph	Me	H	Me	H	H	H	H	H	Me	Me
33-42	Ph	Me	H	H	Me	H	H	H	H	Me	Me
33-43	Ph	Me	H	H	H	Me	H	H	H	Me	Me
33-44	Ph	Me	H	H	H	H	Me	H	H	Me	Me
33-45	Ph	Me	H	H	H	H	H	Me	H	Me	Me
33-46	Ph	Me	H	H	H	H	H	H	Me	Me	Me
33-47	Ph	Me	H	Ph	H	H	H	H	H	Me	Me
33-48	Ph	Me	H	H	Ph	H	H	H	H	Me	Me
33-49	Ph	Me	H	H	H	Ph	H	H	H	Me	Me
33-50	Ph	Me	H	H	H	H	Ph	H	H	Me	Me
33-51	Ph	Me	H	H	H	H	H	Ph	H	Me	Me
33-52	Ph	Me	H	H	H	H	H	H	Ph	Me	Me
33-53	Me	H	Me	H	H	H	H	H	H	Me	Me
33-54	Me	H	Me	Me	H	H	H	H	H	Me	Me
33-55	Me	H	Me	H	Me	H	H	H	H	Me	Me
33-56	Me	H	Me	H	H	Me	H	H	H	Me	Me
33-57	Me	H	Me	H	H	H	Me	H	H	Me	Me
33-58	Me	H	Me	H	H	H	H	Me	H	Me	Me
33-59	Me	H	Me	H	H	H	H	H	Me	Me	Me
33-60	Me	H	Me	Ph	H	H	H	H	H	Me	Me
33-61	Me	H	Me	H	Ph	H	H	H	H	Me	Me
33-62	Me	H	Me	H	H	Ph	H	H	H	Me	Me
33-63	Me	H	Me	H	H	H	Ph	H	H	Me	Me
33-64	Me	H	Me	H	H	H	H	Ph	H	Me	Me
33-65	Me	H	Me	H	H	H	H	H	Ph	Me	Me
33-66	Ph	H	Me	H	H	H	H	H	H	Me	Me
33-67	Ph	H	Me	Me	H	H	H	H	H	Me	Me
33-68	Ph	H	Me	H	Me	H	H	H	H	Me	Me
33-69	Ph	H	Me	H	H	Me	H	H	H	Me	Me
33-70	Ph	H	Me	H	H	H	Me	H	H	Me	Me
33-71	Ph	H	Me	H	H	H	H	Me	H	Me	Me
33-72	Ph	H	Me	H	H	H	H	H	Me	Me	Me
33-73	Ph	H	Me	Ph	H	H	H	H	H	Me	Me
33-74	Ph	H	Me	H	Ph	H	H	H	H	Me	Me
33-75	Ph	H	Me	H	H	Ph	H	H	H	Me	Me
33-76	Ph	H	Me	H	H	H	Ph	H	H	Me	Me
33-77	Ph	H	Me	H	H	H	H	Ph	H	Me	Me
33-78	Ph	H	Me	H	H	H	H	H	Ph	Me	Me
33-79	Me	Ph	H	H	H	H	H	H	H	Me	Me
33-80	Me	Ph	H	Me	H	H	H	H	H	Me	Me
33-81	Me	Ph	H	H	Me	H	H	H	H	Me	Me
33-82	Me	Ph	H	H	H	Me	H	H	H	Me	Me
33-83	Me	Ph	H	H	H	H	Me	H	H	Me	Me
33-84	Me	Ph	H	H	H	H	H	Me	H	Me	Me
33-85	Me	Ph	H	H	H	H	H	H	Me	Me	Me
33-86	Me	Ph	H	Ph	H	H	H	H	H	Me	Me
33-87	Me	Ph	H	H	Ph	H	H	H	H	Me	Me
33-88	Me	Ph	H	H	H	Ph	H	H	H	Me	Me
33-89	Me	Ph	H	H	H	H	Ph	H	H	Me	Me
33-90	Me	Ph	H	H	H	H	H	Ph	H	Me	Me
33-91	Me	Ph	H	H	H	H	H	H	Ph	Me	Me
33-92	Ph	Ph	H	H	H	H	H	H	H	Me	Me
33-93	Ph	Ph	H	Me	H	H	H	H	H	Me	Me
33-94	Ph	Ph	H	H	Me	H	H	H	H	Me	Me
33-95	Ph	Ph	H	H	H	Me	H	H	H	Me	Me
33-96	Ph	Ph	H	H	H	H	Me	H	H	Me	Me
33-97	Ph	Ph	H	H	H	H	H	Me	H	Me	Me
33-98	Ph	Ph	H	H	H	H	H	H	Me	Me	Me
33-99	Ph	Ph	H	Ph	H	H	H	H	H	Me	Me
33-100	Ph	Ph	H	H	Ph	H	H	H	H	Me	Me
33-101	Ph	Ph	H	H	H	Ph	H	H	H	Me	Me
33-102	Ph	Ph	H	H	H	H	Ph	H	H	Me	Me
33-103	Ph	Ph	H	H	H	H	H	Ph	H	Me	Me
33-104	Ph	Ph	H	H	H	H	H	H	Ph	Me	Me
33-105	Me	H	Ph	H	H	H	H	H	H	Me	Me
33-106	Me	H	Ph	Me	H	H	H	H	H	Me	Me
33-107	Me	H	Ph	H	Me	H	H	H	H	Me	Me
33-108	Me	H	Ph	H	H	Me	H	H	H	Me	Me
33-109	Me	H	Ph	H	H	H	Me	H	H	Me	Me
33-110	Me	H	Ph	H	H	H	H	Me	H	Me	Me
33-111	Me	H	Ph	H	H	H	H	H	Me	Me	Me
33-112	Me	H	Ph	Ph	H	H	H	H	H	Me	Me
33-113	Me	H	Ph	H	Ph	H	H	H	H	Me	Me

TABLE 33-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
33-114	Me	H	Ph	H	H	Ph	H	H	H	Me	Me
33-115	Me	H	Ph	H	H	H	Ph	H	H	Me	Me
33-116	Me	H	Ph	H	H	H	H	Ph	H	Me	Me
33-117	Me	H	Ph	H	H	H	H	H	Ph	Me	Me
33-118	Ph	H	Ph	H	H	H	H	H	H	Me	Me
33-119	Ph	H	Ph	Me	H	H	H	H	H	Me	Me
33-120	Ph	H	Ph	H	Me	H	H	H	H	Me	Me
33-121	Ph	H	Ph	H	H	Me	H	H	H	Me	Me
33-122	Ph	H	Ph	H	H	H	Me	H	H	Me	Me
33-123	Ph	H	Ph	H	H	H	H	Me	H	Me	Me
33-124	Ph	H	Ph	H	H	H	H	H	Me	Me	Me
33-125	Ph	H	Ph	Ph	H	H	H	H	H	Me	Me
33-126	Ph	H	Ph	H	Ph	H	H	H	H	Me	Me
33-127	Ph	H	Ph	H	H	Ph	H	H	H	Me	Me
33-128	Ph	H	Ph	H	H	H	Ph	H	H	Me	Me
33-129	Ph	H	Ph	H	H	H	H	Ph	H	Me	Me
33-130	Ph	H	Ph	H	H	H	H	H	Ph	Me	Me

TABLE 34

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
34-1	Me	H	H	H	H	H	H	H	H	H	Me	Me
34-2	Me	H	H	H	Me	H	H	H	H	H	Me	Me
34-3	Me	H	H	H	H	Me	H	H	H	H	Me	Me
34-4	Me	H	H	H	H	H	Me	H	H	H	Me	Me
34-5	Me	H	H	H	H	H	H	Me	H	H	Me	Me
34-6	Me	H	H	H	H	H	H	H	Me	H	Me	Me
34-7	Me	H	H	H	H	H	H	H	H	Me	Me	Me
34-8	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
34-9	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
34-10	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
34-11	Me	H	H	H	H	H	H	Ph	H	H	Me	Me
34-12	Me	H	H	H	H	H	H	H	Ph	H	Me	Me
34-13	Me	H	H	H	H	H	H	H	H	Ph	Me	Me
34-14	Ph	H	H	H	H	H	H	H	H	H	Me	Me
34-15	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
34-16	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
34-17	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
34-18	Ph	H	H	H	H	H	H	Me	H	H	Me	Me
34-19	Ph	H	H	H	H	H	H	H	Me	H	Me	Me
34-20	Ph	H	H	H	H	H	H	H	H	Me	Me	Me
34-21	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
34-22	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
34-23	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
34-24	Ph	H	H	H	H	H	H	Ph	H	H	Me	Me
34-25	Ph	H	H	H	H	H	H	H	Ph	H	Me	Me
34-26	Ph	H	H	H	H	H	H	H	H	Ph	Me	Me
34-27	Me	Me	H	H	H	H	H	H	H	H	Me	Me
34-28	Me	Me	H	H	Me	H	H	H	H	H	Me	Me
34-29	Me	Me	H	H	H	Me	H	H	H	H	Me	Me
34-30	Me	Me	H	H	H	H	Me	H	H	H	Me	Me
34-31	Me	Me	H	H	H	H	H	Me	H	H	Me	Me
34-32	Me	Me	H	H	H	H	H	H	Me	H	Me	Me
34-33	Me	Me	H	H	H	H	H	H	H	Me	Me	Me
34-34	Me	Me	H	H	Ph	H	H	H	H	H	Me	Me
34-35	Me	Me	H	H	H	Ph	H	H	H	H	Me	Me
34-36	Me	Me	H	H	H	H	Ph	H	H	H	Me	Me
34-37	Me	Me	H	H	H	H	H	Ph	H	H	Me	Me
34-38	Me	Me	H	H	H	H	H	H	Ph	H	Me	Me
34-39	Me	Me	H	H	H	H	H	H	H	Ph	Me	Me
34-40	Ph	Me	H	H	H	H	H	H	H	H	Me	Me
34-41	Ph	Me	H	H	Me	H	H	H	H	H	Me	Me
34-42	Ph	Me	H	H	H	Me	H	H	H	H	Me	Me
34-43	Ph	Me	H	H	H	H	Me	H	H	H	Me	Me
34-44	Ph	Me	H	H	H	H	H	Me	H	H	Me	Me
34-45	Ph	Me	H	H	H	H	H	H	Me	H	Me	Me
34-46	Ph	Me	H	H	H	H	H	H	H	Me	Me	Me
34-47	Ph	Me	H	H	Ph	H	H	H	H	H	Me	Me
34-48	Ph	Me	H	H	H	Ph	H	H	H	H	Me	Me
34-49	Ph	Me	H	H	H	H	Ph	H	H	H	Me	Me
34-50	Ph	Me	H	H	H	H	H	Ph	H	H	Me	Me
34-51	Ph	Me	H	H	H	H	H	H	Ph	H	Me	Me
34-52	Ph	Me	H	H	H	H	H	H	H	Ph	Me	Me
34-53	Me	H	Me	H	H	H	H	H	H	H	Me	Me

TABLE 34-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
34-54	Me	H	Me	H	Me	H	H	H	H	H	Me	Me
34-55	Me	H	Me	H	H	Me	H	H	H	H	Me	Me
34-56	Me	H	Me	H	H	H	Me	H	H	H	Me	Me
34-57	Me	H	Me	H	H	H	H	Me	H	H	Me	Me
34-58	Me	H	Me	H	H	H	H	H	Me	H	Me	Me
34-59	Me	H	Me	H	H	H	H	H	H	Me	Me	Me
34-60	Me	H	Me	H	Ph	H	H	H	H	H	Me	Me
34-61	Me	H	Me	H	H	Ph	H	H	H	H	Me	Me
34-62	Me	H	Me	H	H	H	Ph	H	H	H	Me	Me
34-63	Me	H	Me	H	H	H	H	Ph	H	H	Me	Me
34-64	Me	H	Me	H	H	H	H	H	Ph	H	Me	Me
34-65	Me	H	Me	H	H	H	H	H	H	Ph	Me	Me
34-66	Ph	H	Me	H	H	H	H	H	H	H	Me	Me
34-67	Ph	H	Me	H	Me	H	H	H	H	H	Me	Me
34-68	Ph	H	Me	H	H	Me	H	H	H	H	Me	Me
34-69	Ph	H	Me	H	H	H	Me	H	H	H	Me	Me
34-70	Ph	H	Me	H	H	H	H	Me	H	H	Me	Me
34-71	Ph	H	Me	H	H	H	H	H	Me	H	Me	Me
34-72	Ph	H	Me	H	H	H	H	H	H	Me	Me	Me
34-73	Ph	H	Me	H	Ph	H	H	H	H	H	Me	Me
34-74	Ph	H	Me	H	H	Ph	H	H	H	H	Me	Me
34-75	Ph	H	Me	H	H	H	Ph	H	H	H	Me	Me
34-76	Ph	H	Me	H	H	H	H	Ph	H	H	Me	Me
34-77	Ph	H	Me	H	H	H	H	H	Ph	H	Me	Me
34-78	Ph	H	Me	H	H	H	H	H	H	Ph	Me	Me
34-79	Me	H	H	Me	H	H	H	H	H	H	Me	Me
34-80	Me	H	H	Me	Me	H	H	H	H	H	Me	Me
34-81	Me	H	H	Me	H	Me	H	H	H	H	Me	Me
34-82	Me	H	H	Me	H	H	Me	H	H	H	Me	Me
34-83	Me	H	H	Me	H	H	H	Me	H	H	Me	Me
34-84	Me	H	H	Me	H	H	H	H	Me	H	Me	Me
34-85	Me	H	H	Me	H	H	H	H	H	Me	Me	Me
34-86	Me	H	H	Me	Ph	H	H	H	H	H	Me	Me
34-87	Me	H	H	Me	H	Ph	H	H	H	H	Me	Me
34-88	Me	H	H	Me	H	H	Ph	H	H	H	Me	Me
34-89	Me	H	H	Me	H	H	H	Ph	H	H	Me	Me
34-90	Me	H	H	Me	H	H	H	H	Ph	H	Me	Me
34-91	Me	H	H	Me	H	H	H	H	H	Ph	Me	Me
34-92	Ph	H	H	Me	H	H	H	H	H	H	Me	Me
34-93	Ph	H	H	Me	Me	H	H	H	H	H	Me	Me
34-94	Ph	H	H	Me	H	Me	H	H	H	H	Me	Me
34-95	Ph	H	H	Me	H	H	Me	H	H	H	Me	Me
34-96	Ph	H	H	Me	H	H	H	Me	H	H	Me	Me
34-97	Ph	H	H	Me	H	H	H	H	Me	H	Me	Me
34-98	Ph	H	H	Me	H	H	H	H	H	Me	Me	Me
34-99	Ph	H	H	Me	Ph	H	H	H	H	H	Me	Me
34-100	Ph	H	H	Me	H	Ph	H	H	H	H	Me	Me
34-101	Ph	H	H	Me	H	H	Ph	H	H	H	Me	Me
34-102	Ph	H	H	Me	H	H	H	Ph	H	H	Me	Me
34-103	Ph	H	H	Me	H	H	H	H	Ph	H	Me	Me
34-104	Ph	H	H	Me	H	H	H	H	H	Ph	Me	Me
34-105	Me	Ph	H	H	H	H	H	H	H	H	Me	Me
34-106	Me	Ph	H	H	Me	H	H	H	H	H	Me	Me
34-107	Me	Ph	H	H	H	Me	H	H	H	H	Me	Me
34-108	Me	Ph	H	H	H	H	Me	H	H	H	Me	Me
34-109	Me	Ph	H	H	H	H	H	Me	H	H	Me	Me
34-110	Me	Ph	H	H	H	H	H	H	Me	H	Me	Me
34-111	Me	Ph	H	H	H	H	H	H	H	Me	Me	Me
34-112	Me	Ph	H	H	Ph	H	H	H	H	H	Me	Me
34-113	Me	Ph	H	H	H	Ph	H	H	H	H	Me	Me
34-114	Me	Ph	H	H	H	H	Ph	H	H	H	Me	Me
34-115	Me	Ph	H	H	H	H	H	Ph	H	H	Me	Me
34-116	Me	Ph	H	H	H	H	H	H	Ph	H	Me	Me
34-117	Me	Ph	H	H	H	H	H	H	H	Ph	Me	Me
34-118	Ph	Ph	H	H	H	H	H	H	H	H	Me	Me
34-119	Ph	Ph	H	H	Me	H	H	H	H	H	Me	Me
34-120	Ph	Ph	H	H	H	Me	H	H	H	H	Me	Me
34-121	Ph	Ph	H	H	H	H	Me	H	H	H	Me	Me
34-122	Ph	Ph	H	H	H	H	H	Me	H	H	Me	Me
34-123	Ph	Ph	H	H	H	H	H	H	Me	H	Me	Me
34-124	Ph	Ph	H	H	H	H	H	H	H	Me	Me	Me
34-125	Ph	Ph	H	H	Ph	H	H	H	H	H	Me	Me
34-126	Ph	Ph	H	H	H	Ph	H	H	H	H	Me	Me
34-127	Ph	Ph	H	H	H	H	Ph	H	H	H	Me	Me
34-128	Ph	Ph	H	H	H	H	H	Ph	H	H	Me	Me
34-129	Ph	Ph	H	H	H	H	H	H	Ph	H	Me	Me
34-130	Ph	Ph	H	H	H	H	H	H	H	Ph	Me	Me
34-131	Me	H	Ph	H	H	H	H	H	H	H	Me	Me

TABLE 34-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
34-132	Me	H	Ph	H	Me	H	H	H	H	H	Me	Me
34-133	Me	H	Ph	H	H	Me	H	H	H	H	Me	Me
34-134	Me	H	Ph	H	H	H	Me	H	H	H	Me	Me
34-135	Me	H	Ph	H	H	H	H	Me	H	H	Me	Me
34-136	Me	H	Ph	H	H	H	H	H	Me	H	Me	Me
34-137	Me	H	Ph	H	H	H	H	H	H	Me	Me	Me
34-138	Me	H	Ph	H	Ph	H	H	H	H	H	Me	Me
34-139	Me	H	Ph	H	H	Ph	H	H	H	H	Me	Me
34-140	Me	H	Ph	H	H	H	Ph	H	H	H	Me	Me
34-141	Me	H	Ph	H	H	H	H	Ph	H	H	Me	Me
34-142	Me	H	Ph	H	H	H	H	H	Ph	H	Me	Me
34-143	Me	H	Ph	H	H	H	H	H	H	Ph	Me	Me
34-144	Ph	H	Ph	H	H	H	H	H	H	H	Me	Me
34-145	Ph	H	Ph	H	Me	H	H	H	H	H	Me	Me
34-146	Ph	H	Ph	H	H	Me	H	H	H	H	Me	Me
34-147	Ph	H	Ph	H	H	H	Me	H	H	H	Me	Me
34-148	Ph	H	Ph	H	H	H	H	Me	H	H	Me	Me
34-149	Ph	H	Ph	H	H	H	H	H	Me	H	Me	Me
34-150	Ph	H	Ph	H	H	H	H	H	H	Me	Me	Me
34-151	Ph	H	Ph	H	Ph	H	H	H	H	H	Me	Me
34-152	Ph	H	Ph	H	H	Ph	H	H	H	H	Me	Me
34-153	Ph	H	Ph	H	H	H	Ph	H	H	H	Me	Me
34-154	Ph	H	Ph	H	H	H	H	Ph	H	H	Me	Me
34-155	Ph	H	Ph	H	H	H	H	H	Ph	H	Me	Me
34-156	Ph	H	Ph	H	H	H	H	H	H	Ph	Me	Me
34-157	Me	H	H	Ph	H	H	H	H	H	H	Me	Me
34-158	Me	H	H	Ph	Me	H	H	H	H	H	Me	Me
34-159	Me	H	H	Ph	H	Me	H	H	H	H	Me	Me
34-160	Me	H	H	Ph	H	H	Me	H	H	H	Me	Me
34-161	Me	H	H	Ph	H	H	H	Me	H	H	Me	Me
34-162	Me	H	H	Ph	H	H	H	H	Me	H	Me	Me
34-163	Me	H	H	Ph	H	H	H	H	H	Me	Me	Me
34-164	Me	H	H	Ph	Ph	H	H	H	H	H	Me	Me
34-165	Me	H	H	Ph	H	Ph	H	H	H	H	Me	Me
34-166	Me	H	H	Ph	H	H	Ph	H	H	H	Me	Me
34-167	Me	H	H	Ph	H	H	H	Ph	H	H	Me	Me
34-168	Me	H	H	Ph	H	H	H	H	Ph	H	Me	Me
34-169	Me	H	H	Ph	H	H	H	H	H	Ph	Me	Me
34-170	Ph	H	H	Ph	H	H	H	H	H	H	Me	Me
34-171	Ph	H	H	Ph	Me	H	H	H	H	H	Me	Me
34-172	Ph	H	H	Ph	H	Me	H	H	H	H	Me	Me
34-173	Ph	H	H	Ph	H	H	Me	H	H	H	Me	Me
34-174	Ph	H	H	Ph	H	H	H	Me	H	H	Me	Me
34-175	Ph	H	H	Ph	H	H	H	H	Me	H	Me	Me
34-176	Ph	H	H	Ph	H	H	H	H	H	Me	Me	Me
34-177	Ph	H	H	Ph	Ph	H	H	H	H	H	Me	Me
34-178	Ph	H	H	Ph	H	Ph	H	H	H	H	Me	Me
34-179	Ph	H	H	Ph	H	H	Ph	H	H	H	Me	Me
34-180	Ph	H	H	Ph	H	H	H	Ph	H	H	Me	Me
34-181	Ph	H	H	Ph	H	H	H	H	Ph	H	Me	Me
34-182	Ph	H	H	Ph	H	H	H	H	H	Ph	Me	Me

TABLE 35

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
35-1	Me	H	H	H	H	H	H	H	H	H	H	Me	Me
35-2	Me	H	H	H	H	Me	H	H	H	H	H	Me	Me
35-3	Me	H	H	H	H	H	Me	H	H	H	H	Me	Me
35-4	Me	H	H	H	H	H	H	Me	H	H	H	Me	Me
35-5	Me	H	H	H	H	H	H	H	Me	H	H	Me	Me
35-6	Me	H	H	H	H	H	H	H	H	Me	H	Me	Me
35-7	Me	H	H	H	H	H	H	H	H	H	Me	Me	Me
35-8	Me	H	H	H	H	Ph	H	H	H	H	H	Me	Me
35-9	Me	H	H	H	H	H	Ph	H	H	H	H	Me	Me
35-10	Me	H	H	H	H	H	H	Ph	H	H	H	Me	Me
35-11	Me	H	H	H	H	H	H	H	Ph	H	H	Me	Me
35-12	Me	H	H	H	H	H	H	H	H	Ph	H	Me	Me
35-13	Me	H	H	H	H	H	H	H	H	H	Ph	Me	Me
35-14	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me
35-15	Ph	H	H	H	H	Me	H	H	H	H	H	Me	Me
35-16	Ph	H	H	H	H	H	Me	H	H	H	H	Me	Me
35-17	Ph	H	H	H	H	H	H	Me	H	H	H	Me	Me
35-18	Ph	H	H	H	H	H	H	H	Me	H	H	Me	Me
35-19	Ph	H	H	H	H	H	H	H	H	Me	H	Me	Me

TABLE 35-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
35-20	Ph	H	H	H	H	H	H	H	H	H	Me	Me	Me
35-21	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	Me
35-22	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	Me
35-23	Ph	H	H	H	H	H	H	Ph	H	H	H	Me	Me
35-24	Ph	H	H	H	H	H	H	H	Ph	H	H	Me	Me
35-25	Ph	H	H	H	H	H	H	H	H	Ph	H	Me	Me
35-26	Ph	H	H	H	H	H	H	H	H	H	Ph	Me	Me
35-27	Me	Me	H	H	H	H	H	H	H	H	H	Me	Me
35-28	Me	Me	H	H	H	Me	H	H	H	H	H	Me	Me
35-29	Me	Me	H	H	H	H	Me	H	H	H	H	Me	Me
35-30	Me	Me	H	H	H	H	H	Me	H	H	H	Me	Me
35-31	Me	Me	H	H	H	H	H	H	Me	H	H	Me	Me
35-32	Me	Me	H	H	H	H	H	H	H	Me	H	Me	Me
35-33	Me	Me	H	H	H	H	H	H	H	H	Me	Me	Me
35-34	Me	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
35-35	Me	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
35-36	Me	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
35-37	Me	Me	H	H	H	H	H	H	Ph	H	H	Me	Me
35-38	Me	Me	H	H	H	H	H	H	H	Ph	H	Me	Me
35-39	Me	Me	H	H	H	H	H	H	H	H	Ph	Me	Me
35-40	Ph	Me	H	H	H	H	H	H	H	H	H	Me	Me
35-41	Ph	Me	H	H	H	Me	H	H	H	H	H	Me	Me
35-42	Ph	Me	H	H	H	H	Me	H	H	H	H	Me	Me
35-43	Ph	Me	H	H	H	H	H	Me	H	H	H	Me	Me
35-44	Ph	Me	H	H	H	H	H	H	Me	H	H	Me	Me
35-45	Ph	Me	H	H	H	H	H	H	H	Me	H	Me	Me
35-46	Ph	Me	H	H	H	H	H	H	H	H	Me	Me	Me
35-47	Ph	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
35-48	Ph	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
35-49	Ph	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
35-50	Ph	Me	H	H	H	H	H	H	Ph	H	H	Me	Me
35-51	Ph	Me	H	H	H	H	H	H	H	Ph	H	Me	Me
35-52	Ph	Me	H	H	H	H	H	H	H	H	Ph	Me	Me
35-53	Me	H	Me	H	H	H	H	H	H	H	H	Me	Me
35-54	Me	H	Me	H	H	Me	H	H	H	H	H	Me	Me
35-55	Me	H	Me	H	H	H	Me	H	H	H	H	Me	Me
35-56	Me	H	Me	H	H	H	H	Me	H	H	H	Me	Me
35-57	Me	H	Me	H	H	H	H	H	Me	H	H	Me	Me
35-58	Me	H	Me	H	H	H	H	H	H	Me	H	Me	Me
35-59	Me	H	Me	H	H	H	H	H	H	H	Me	Me	Me
35-60	Me	H	Me	H	H	Ph	H	H	H	H	H	Me	Me
35-61	Me	H	Me	H	H	H	Ph	H	H	H	H	Me	Me
35-62	Me	H	Me	H	H	H	H	Ph	H	H	H	Me	Me
35-63	Me	H	Me	H	H	H	H	H	Ph	H	H	Me	Me
35-64	Me	H	Me	H	H	H	H	H	H	Ph	H	Me	Me
35-65	Me	H	Me	H	H	H	H	H	H	H	Ph	Me	Me
35-66	Ph	H	Me	H	H	H	H	H	H	H	H	Me	Me
35-67	Ph	H	Me	H	H	Me	H	H	H	H	H	Me	Me
35-68	Ph	H	Me	H	H	H	Me	H	H	H	H	Me	Me
35-69	Ph	H	Me	H	H	H	H	Me	H	H	H	Me	Me
35-70	Ph	H	Me	H	H	H	H	H	Me	H	H	Me	Me
35-71	Ph	H	Me	H	H	H	H	H	H	Me	H	Me	Me
35-72	Ph	H	Me	H	H	H	H	H	H	H	Me	Me	Me
35-73	Ph	H	Me	H	H	Ph	H	H	H	H	H	Me	Me
35-74	Ph	H	Me	H	H	H	Ph	H	H	H	H	Me	Me
35-75	Ph	H	Me	H	H	H	H	Ph	H	H	H	Me	Me
35-76	Ph	H	Me	H	H	H	H	H	Ph	H	H	Me	Me
35-77	Ph	H	Me	H	H	H	H	H	H	Ph	H	Me	Me
35-78	Ph	H	Me	H	H	H	H	H	H	H	Ph	Me	Me
35-79	Me	H	H	Me	H	H	H	H	H	H	H	Me	Me
35-80	Me	H	H	Me	H	Me	H	H	H	H	H	Me	Me
35-81	Me	H	H	Me	H	H	Me	H	H	H	H	Me	Me
35-82	Me	H	H	Me	H	H	H	Me	H	H	H	Me	Me
35-83	Me	H	H	Me	H	H	H	H	Me	H	H	Me	Me
35-84	Me	H	H	Me	H	H	H	H	H	Me	H	Me	Me
35-85	Me	H	H	Me	H	H	H	H	H	H	Me	Me	Me
35-86	Me	H	H	Me	H	Ph	H	H	H	H	H	Me	Me
35-87	Me	H	H	Me	H	H	Ph	H	H	H	H	Me	Me
35-88	Me	H	H	Me	H	H	H	Ph	H	H	H	Me	Me
35-89	Me	H	H	Me	H	H	H	H	Ph	H	H	Me	Me
35-90	Me	H	H	Me	H	H	H	H	H	Ph	H	Me	Me
35-91	Me	H	H	Me	H	H	H	H	H	H	Ph	Me	Me
35-92	Ph	H	H	Me	H	H	H	H	H	H	H	Me	Me
35-93	Ph	H	H	Me	H	Me	H	H	H	H	H	Me	Me
35-94	Ph	H	H	Me	H	H	Me	H	H	H	H	Me	Me
35-95	Ph	H	H	Me	H	H	H	Me	H	H	H	Me	Me
35-96	Ph	H	H	Me	H	H	H	H	Me	H	H	Me	Me
35-97	Ph	H	H	Me	H	H	H	H	H	Me	H	Me	Me

TABLE 35-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
35-98	Ph	H	H	Me	H	H	H	H	H	H	Me	Me	Me
35-99	Ph	H	H	Me	H	Ph	H	H	H	H	H	Me	Me
35-100	Ph	H	H	Me	H	H	Ph	H	H	H	H	Me	Me
35-101	Ph	H	H	Me	H	H	H	Ph	H	H	H	Me	Me
35-102	Ph	H	H	Me	H	H	H	H	Ph	H	H	Me	Me
35-103	Ph	H	H	Me	H	H	H	H	H	Ph	H	Me	Me
35-104	Ph	H	H	Me	H	H	H	H	H	H	Ph	Me	Me
35-105	Me	H	H	H	Me	H	H	H	H	H	H	Me	Me
35-106	Me	H	H	H	Me	Me	H	H	H	H	H	Me	Me
35-107	Me	H	H	H	Me	H	Me	H	H	H	H	Me	Me
35-108	Me	H	H	H	Me	H	H	Me	H	H	H	Me	Me
35-109	Me	H	H	H	Me	H	H	H	Me	H	H	Me	Me
35-110	Me	H	H	H	Me	H	H	H	H	Me	H	Me	Me
35-111	Me	H	H	H	Me	H	H	H	H	H	Me	Me	Me
35-112	Me	H	H	H	Me	Ph	H	H	H	H	H	Me	Me
35-113	Me	H	H	H	Me	H	Ph	H	H	H	H	Me	Me
35-114	Me	H	H	H	Me	H	H	Ph	H	H	H	Me	Me
35-115	Me	H	H	H	Me	H	H	H	Ph	H	H	Me	Me
35-116	Me	H	H	H	Me	H	H	H	H	Ph	H	Me	Me
35-117	Me	H	H	H	Me	H	H	H	H	H	Ph	Me	Me
35-118	Ph	H	H	H	Me	H	H	H	H	H	H	Me	Me
35-119	Ph	H	H	H	Me	Me	H	H	H	H	H	Me	Me
35-120	Ph	H	H	H	Me	H	Me	H	H	H	H	Me	Me
35-121	Ph	H	H	H	Me	H	H	Me	H	H	H	Me	Me
35-122	Ph	H	H	H	Me	H	H	H	Me	H	H	Me	Me
35-123	Ph	H	H	H	Me	H	H	H	H	Me	H	Me	Me
35-124	Ph	H	H	H	Me	H	H	H	H	H	Me	Me	Me
35-125	Ph	H	H	H	Me	Ph	H	H	H	H	H	Me	Me
35-126	Ph	H	H	H	Me	H	Ph	H	H	H	H	Me	Me
35-127	Ph	H	H	H	Me	H	H	Ph	H	H	H	Me	Me
35-128	Ph	H	H	H	Me	H	H	H	Ph	H	H	Me	Me
35-129	Ph	H	H	H	Me	H	H	H	H	Ph	H	Me	Me
35-130	Ph	H	H	H	Me	H	H	H	H	H	Ph	Me	Me
35-131	Me	Ph	H	H	H	H	H	H	H	H	H	Me	Me
35-132	Me	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
35-133	Me	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
35-134	Me	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
35-135	Me	Ph	H	H	H	H	H	H	Me	H	H	Me	Me
35-136	Me	Ph	H	H	H	H	H	H	H	Me	H	Me	Me
35-137	Me	Ph	H	H	H	H	H	H	H	H	Me	Me	Me
35-138	Me	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
35-139	Me	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
35-140	Me	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
35-141	Me	Ph	H	H	H	H	H	H	Ph	H	H	Me	Me
35-142	Me	Ph	H	H	H	H	H	H	H	Ph	H	Me	Me
35-143	Me	Ph	H	H	H	H	H	H	H	H	Ph	Me	Me
35-144	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	Me
35-145	Ph	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
35-146	Ph	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
35-147	Ph	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
35-148	Ph	Ph	H	H	H	H	H	H	Me	H	H	Me	Me
35-149	Ph	Ph	H	H	H	H	H	H	H	Me	H	Me	Me
35-150	Ph	Ph	H	H	H	H	H	H	H	H	Me	Me	Me
35-151	Ph	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
35-152	Ph	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
35-153	Ph	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
35-154	Ph	Ph	H	H	H	H	H	H	Ph	H	H	Me	Me
35-155	Ph	Ph	H	H	H	H	H	H	H	Ph	H	Me	Me
35-156	Ph	Ph	H	H	H	H	H	H	H	H	Ph	Me	Me
35-157	Me	H	Ph	H	H	H	H	H	H	H	H	Me	Me
35-158	Me	H	Ph	H	H	Me	H	H	H	H	H	Me	Me
35-159	Me	H	Ph	H	H	H	Me	H	H	H	H	Me	Me
35-160	Me	H	Ph	H	H	H	H	Me	H	H	H	Me	Me
35-161	Me	H	Ph	H	H	H	H	H	Me	H	H	Me	Me
35-162	Me	H	Ph	H	H	H	H	H	H	Me	H	Me	Me
35-163	Me	H	Ph	H	H	H	H	H	H	H	Me	Me	Me
35-164	Me	H	Ph	H	H	Ph	H	H	H	H	H	Me	Me
35-165	Me	H	Ph	H	H	H	Ph	H	H	H	H	Me	Me
35-166	Me	H	Ph	H	H	H	H	Ph	H	H	H	Me	Me
35-167	Me	H	Ph	H	H	H	H	H	Ph	H	H	Me	Me
35-168	Me	H	Ph	H	H	H	H	H	H	Ph	H	Me	Me
35-169	Me	H	Ph	H	H	H	H	H	H	H	Ph	Me	Me
35-170	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	Me
35-171	Ph	H	Ph	H	H	Me	H	H	H	H	H	Me	Me
35-172	Ph	H	Ph	H	H	H	Me	H	H	H	H	Me	Me
35-173	Ph	H	Ph	H	H	H	H	Me	H	H	H	Me	Me
35-174	Ph	H	Ph	H	H	H	H	H	Me	H	H	Me	Me
35-175	Ph	H	Ph	H	H	H	H	H	H	Me	H	Me	Me

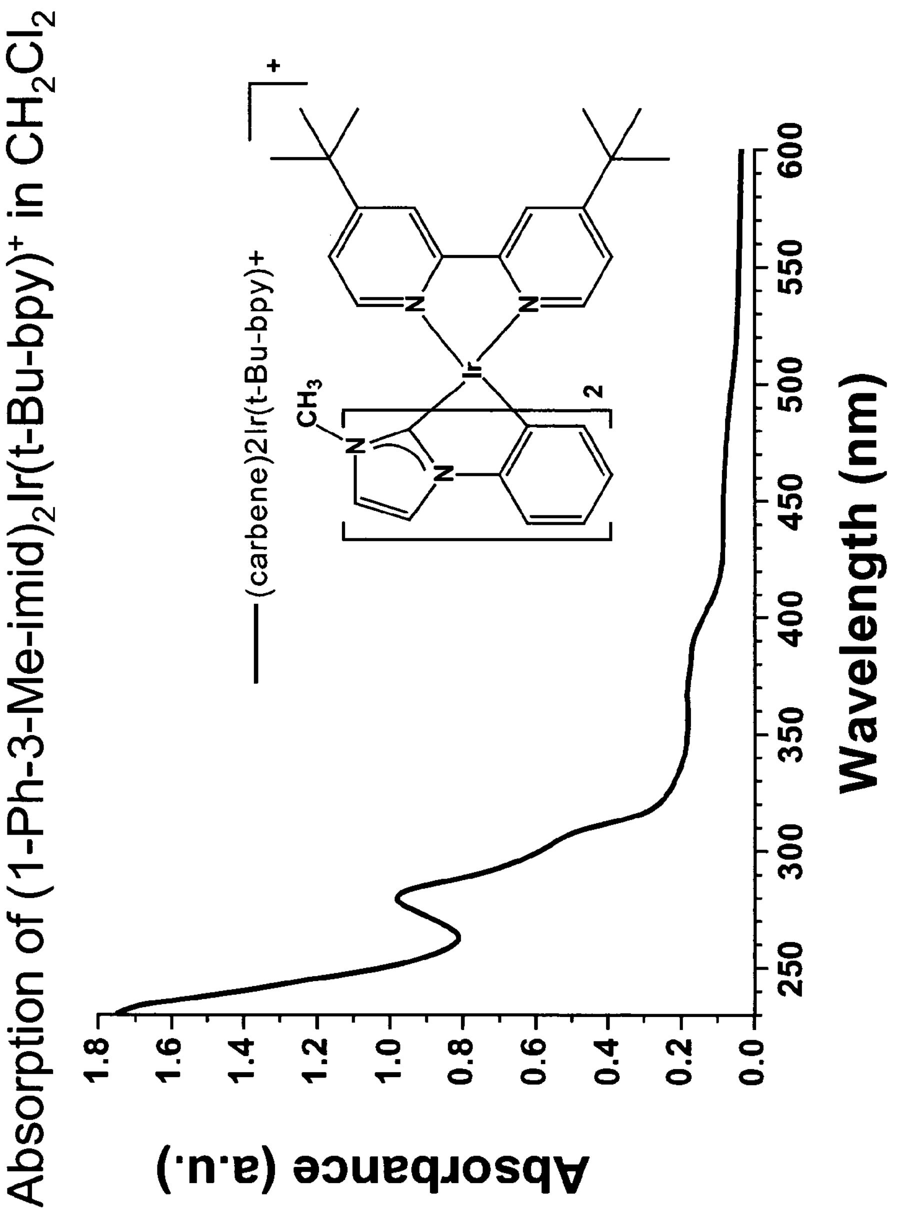

Absorption of (1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$ in CH$_2$Cl$_2$
(carbene)2Ir(t-Bu-bpy)+
CH$_3$
N
N
Ir
N
N
2
+
Absorbance (a.u.)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
250
300
350
400
450
500
550
600
Wavelength (nm)

Figure 13

TABLE 35-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
35-176	Ph	H	Ph	H	H	H	H	H	H	H	Me	Me	Me
35-177	Ph	H	Ph	H	H	Ph	H	H	H	H	H	Me	Me
35-178	Ph	H	Ph	H	H	H	Ph	H	H	H	H	Me	Me
35-179	Ph	H	Ph	H	H	H	H	Ph	H	H	H	Me	Me
35-180	Ph	H	Ph	H	H	H	H	H	Ph	H	H	Me	Me
35-181	Ph	H	Ph	H	H	H	H	H	H	Ph	H	Me	Me
35-182	Ph	H	Ph	H	H	H	H	H	H	H	Ph	Me	Me
35-183	Me	H	H	Ph	H	H	H	H	H	H	H	Me	Me
35-184	Me	H	H	Ph	H	Me	H	H	H	H	H	Me	Me
35-185	Me	H	H	Ph	H	H	Me	H	H	H	H	Me	Me
35-186	Me	H	H	Ph	H	H	H	Me	H	H	H	Me	Me
35-187	Me	H	H	Ph	H	H	H	H	Me	H	H	Me	Me
35-188	Me	H	H	Ph	H	H	H	H	H	Me	H	Me	Me
35-189	Me	H	H	Ph	H	H	H	H	H	H	Me	Me	Me
35-190	Me	H	H	Ph	H	Ph	H	H	H	H	H	Me	Me
35-191	Me	H	H	Ph	H	H	Ph	H	H	H	H	Me	Me
35-192	Me	H	H	Ph	H	H	H	Ph	H	H	H	Me	Me
35-193	Me	H	H	Ph	H	H	H	H	Ph	H	H	Me	Me
35-194	Me	H	H	Ph	H	H	H	H	H	Ph	H	Me	Me
35-195	Me	H	H	Ph	H	H	H	H	H	H	Ph	Me	Me
35-196	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	Me
35-197	Ph	H	H	Ph	H	Me	H	H	H	H	H	Me	Me
35-198	Ph	H	H	Ph	H	H	Me	H	H	H	H	Me	Me
35-199	Ph	H	H	Ph	H	H	H	Me	H	H	H	Me	Me
35-200	Ph	H	H	Ph	H	H	H	H	Me	H	H	Me	Me
35-201	Ph	H	H	Ph	H	H	H	H	H	Me	H	Me	Me
35-202	Ph	H	H	Ph	H	H	H	H	H	H	Me	Me	Me
35-203	Ph	H	H	Ph	H	Ph	H	H	H	H	H	Me	Me
35-204	Ph	H	H	Ph	H	H	Ph	H	H	H	H	Me	Me
35-205	Ph	H	H	Ph	H	H	H	Ph	H	H	H	Me	Me
35-206	Ph	H	H	Ph	H	H	H	H	Ph	H	H	Me	Me
35-207	Ph	H	H	Ph	H	H	H	H	H	Ph	H	Me	Me
35-208	Ph	H	H	Ph	H	H	H	H	H	H	Ph	Me	Me
35-209	Me	H	H	H	Ph	H	H	H	H	H	H	Me	Me
35-210	Me	H	H	H	Ph	Me	H	H	H	H	H	Me	Me
35-211	Me	H	H	H	Ph	H	Me	H	H	H	H	Me	Me
35-212	Me	H	H	H	Ph	H	H	Me	H	H	H	Me	Me
35-213	Me	H	H	H	Ph	H	H	H	Me	H	H	Me	Me
35-214	Me	H	H	H	Ph	H	H	H	H	Me	H	Me	Me
35-215	Me	H	H	H	Ph	H	H	H	H	H	Me	Me	Me
35-216	Me	H	H	H	Ph	Ph	H	H	H	H	H	Me	Me
35-217	Me	H	H	H	Ph	H	Ph	H	H	H	H	Me	Me
35-218	Me	H	H	H	Ph	H	H	Ph	H	H	H	Me	Me
35-219	Me	H	H	H	Ph	H	H	H	Ph	H	H	Me	Me
35-220	Me	H	H	H	Ph	H	H	H	H	Ph	H	Me	Me
35-221	Me	H	H	H	Ph	H	H	H	H	H	Ph	Me	Me
35-222	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	Me
35-223	Ph	H	H	H	Ph	Me	H	H	H	H	H	Me	Me
35-224	Ph	H	H	H	Ph	H	Me	H	H	H	H	Me	Me
35-225	Ph	H	H	H	Ph	H	H	Me	H	H	H	Me	Me
35-226	Ph	H	H	H	Ph	H	H	H	Me	H	H	Me	Me
35-227	Ph	H	H	H	Ph	H	H	H	H	Me	H	Me	Me
35-228	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me	Me
35-229	Ph	H	H	H	Ph	Ph	H	H	H	H	H	Me	Me
35-230	Ph	H	H	H	Ph	H	Ph	H	H	H	H	Me	Me
35-231	Ph	H	H	H	Ph	H	H	Ph	H	H	H	Me	Me
35-232	Ph	H	H	H	Ph	H	H	H	Ph	H	H	Me	Me
35-233	Ph	H	H	H	Ph	H	H	H	H	Ph	H	Me	Me
35-234	Ph	H	H	H	Ph	H	H	H	H	H	Ph	Me	Me

TABLE 36

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-1	Me	H	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-2	Me	H	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-3	Me	H	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-4	Me	H	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-5	Me	H	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-6	Me	H	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-7	Me	H	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-8	Me	H	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-9	Me	H	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-10	Me	H	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-11	Me	H	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me

TABLE 36-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-12	Me	H	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-13	Me	H	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-14	Ph	H	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-15	Ph	H	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-16	Ph	H	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-17	Ph	H	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-18	Ph	H	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-19	Ph	H	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-20	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-21	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-22	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-23	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-24	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-25	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-26	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-27	Me	Me	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-28	Me	Me	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-29	Me	Me	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-30	Me	Me	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-31	Me	Me	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-32	Me	Me	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-33	Me	Me	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-34	Me	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-35	Me	Me	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-36	Me	Me	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-37	Me	Me	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-38	Me	Me	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-39	Me	Me	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-40	Ph	Me	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-41	Ph	Me	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-42	Ph	Me	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-43	Ph	Me	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-44	Ph	Me	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-45	Ph	Me	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-46	Ph	Me	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-47	Ph	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-48	Ph	Me	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-49	Ph	Me	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-50	Ph	Me	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-51	Ph	Me	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-52	Ph	Me	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-53	Me	H	Me	H	H	H	H	H	H	H	H	H	H	Me	Me
36-54	Me	H	Me	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-55	Me	H	Me	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-56	Me	H	Me	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-57	Me	H	Me	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-58	Me	H	Me	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-59	Me	H	Me	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-60	Me	H	Me	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-61	Me	H	Me	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-62	Me	H	Me	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-63	Me	H	Me	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-64	Me	H	Me	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-65	Me	H	Me	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-66	Ph	H	Me	H	H	H	H	H	H	H	H	H	H	Me	Me
36-67	Ph	H	Me	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-68	Ph	H	Me	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-69	Ph	H	Me	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-70	Ph	H	Me	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-71	Ph	H	Me	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-72	Ph	H	Me	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-73	Ph	H	Me	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-74	Ph	H	Me	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-75	Ph	H	Me	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-76	Ph	H	Me	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-77	Ph	H	Me	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-78	Ph	H	Me	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-79	Me	H	H	Me	H	H	H	H	H	H	H	H	H	Me	Me
36-80	Me	H	H	Me	H	H	H	Me	H	H	H	H	H	Me	Me
36-81	Me	H	H	Me	H	H	H	H	Me	H	H	H	H	Me	Me
36-82	Me	H	H	Me	H	H	H	H	H	Me	H	H	H	Me	Me
36-83	Me	H	H	Me	H	H	H	H	H	H	Me	H	H	Me	Me
36-84	Me	H	H	Me	H	H	H	H	H	H	H	Me	H	Me	Me
36-85	Me	H	H	Me	H	H	H	H	H	H	H	H	Me	Me	Me
36-86	Me	H	H	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
36-87	Me	H	H	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
36-88	Me	H	H	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
36-89	Me	H	H	Me	H	H	H	H	H	H	Ph	H	H	Me	Me

TABLE 36-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-90	Me	H	H	Me	H	H	H	H	H	H	H	Ph	H	Me	Me
36-91	Me	H	H	Me	H	H	H	H	H	H	H	H	Ph	Me	Me
36-92	Ph	H	H	Me	H	H	H	H	H	H	H	H	H	Me	Me
36-93	Ph	H	H	Me	H	H	H	Me	H	H	H	H	H	Me	Me
36-94	Ph	H	H	Me	H	H	H	H	Me	H	H	H	H	Me	Me
36-95	Ph	H	H	Me	H	H	H	H	H	Me	H	H	H	Me	Me
36-96	Ph	H	H	Me	H	H	H	H	H	H	Me	H	H	Me	Me
36-97	Ph	H	H	Me	H	H	H	H	H	H	H	Me	H	Me	Me
36-98	Ph	H	H	Me	H	H	H	H	H	H	H	H	Me	Me	Me
36-99	Ph	H	H	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
36-100	Ph	H	H	Me	H	H	H	H	Ph	H	H	H	H	Me	Me
36-101	Ph	H	H	Me	H	H	H	H	H	Ph	H	H	H	Me	Me
36-102	Ph	H	H	Me	H	H	H	H	H	H	Ph	H	H	Me	Me
36-103	Ph	H	H	Me	H	H	H	H	H	H	H	Ph	H	Me	Me
36-104	Ph	H	H	Me	H	H	H	H	H	H	H	H	Ph	Me	Me
36-105	Me	H	H	H	Me	H	H	H	H	H	H	H	H	Me	Me
36-106	Me	H	H	H	Me	H	H	Me	H	H	H	H	H	Me	Me
36-107	Me	H	H	H	Me	H	H	H	Me	H	H	H	H	Me	Me
36-108	Me	H	H	H	Me	H	H	H	H	Me	H	H	H	Me	Me
36-109	Me	H	H	H	Me	H	H	H	H	H	Me	H	H	Me	Me
36-110	Me	H	H	H	Me	H	H	H	H	H	H	Me	H	Me	Me
36-111	Me	H	H	H	Me	H	H	H	H	H	H	H	Me	Me	Me
36-112	Me	H	H	H	Me	H	H	Ph	H	H	H	H	H	Me	Me
36-113	Me	H	H	H	Me	H	H	H	Ph	H	H	H	H	Me	Me
36-114	Me	H	H	H	Me	H	H	H	H	Ph	H	H	H	Me	Me
36-115	Me	H	H	H	Me	H	H	H	H	H	Ph	H	H	Me	Me
36-116	Me	H	H	H	Me	H	H	H	H	H	H	Ph	H	Me	Me
36-117	Me	H	H	H	Me	H	H	H	H	H	H	H	Ph	Me	Me
36-118	Ph	H	H	H	Me	H	H	H	H	H	H	H	H	Me	Me
36-119	Ph	H	H	H	Me	H	H	Me	H	H	H	H	H	Me	Me
36-120	Ph	H	H	H	Me	H	H	H	Me	H	H	H	H	Me	Me
36-121	Ph	H	H	H	Me	H	H	H	H	Me	H	H	H	Me	Me
36-122	Ph	H	H	H	Me	H	H	H	H	H	Me	H	H	Me	Me
36-123	Ph	H	H	H	Me	H	H	H	H	H	H	Me	H	Me	Me
36-124	Ph	H	H	H	Me	H	H	H	H	H	H	H	Me	Me	Me
36-125	Ph	H	H	H	Me	H	H	Ph	H	H	H	H	H	Me	Me
36-126	Ph	H	H	H	Me	H	H	H	Ph	H	H	H	H	Me	Me
36-127	Ph	H	H	H	Me	H	H	H	H	Ph	H	H	H	Me	Me
36-128	Ph	H	H	H	Me	H	H	H	H	H	Ph	H	H	Me	Me
36-129	Ph	H	H	H	Me	H	H	H	H	H	H	Ph	H	Me	Me
36-130	Ph	H	H	H	Me	H	H	H	H	H	H	H	Ph	Me	Me
36-131	Me	H	H	H	H	Me	H	H	H	H	H	H	H	Me	Me
36-132	Me	H	H	H	H	Me	H	Me	H	H	H	H	H	Me	Me
36-133	Me	H	H	H	H	Me	H	H	Me	H	H	H	H	Me	Me
36-134	Me	H	H	H	H	Me	H	H	H	Me	H	H	H	Me	Me
36-135	Me	H	H	H	H	Me	H	H	H	H	Me	H	H	Me	Me
36-136	Me	H	H	H	H	Me	H	H	H	H	H	Me	H	Me	Me
36-137	Me	H	H	H	H	Me	H	H	H	H	H	H	Me	Me	Me
36-138	Me	H	H	H	H	Me	H	Ph	H	H	H	H	H	Me	Me
36-139	Me	H	H	H	H	Me	H	H	Ph	H	H	H	H	Me	Me
36-140	Me	H	H	H	H	Me	H	H	H	Ph	H	H	H	Me	Me
36-141	Me	H	H	H	H	Me	H	H	H	H	Ph	H	H	Me	Me
36-142	Me	H	H	H	H	Me	H	H	H	H	H	Ph	H	Me	Me
36-143	Me	H	H	H	H	Me	H	H	H	H	H	H	Ph	Me	Me
36-144	Ph	H	H	H	H	Me	H	H	H	H	H	H	H	Me	Me
36-145	Ph	H	H	H	H	Me	H	Me	H	H	H	H	H	Me	Me
36-146	Ph	H	H	H	H	Me	H	H	Me	H	H	H	H	Me	Me
36-147	Ph	H	H	H	H	Me	H	H	H	Me	H	H	H	Me	Me
36-148	Ph	H	H	H	H	Me	H	H	H	H	Me	H	H	Me	Me
36-149	Ph	H	H	H	H	Me	H	H	H	H	H	Me	H	Me	Me
36-150	Ph	H	H	H	H	Me	H	H	H	H	H	H	Me	Me	Me
36-151	Ph	H	H	H	H	Me	H	Ph	H	H	H	H	H	Me	Me
36-152	Ph	H	H	H	H	Me	H	H	Ph	H	H	H	H	Me	Me
36-153	Ph	H	H	H	H	Me	H	H	H	Ph	H	H	H	Me	Me
36-154	Ph	H	H	H	H	Me	H	H	H	H	Ph	H	H	Me	Me
36-155	Ph	H	H	H	H	Me	H	H	H	H	H	Ph	H	Me	Me
36-156	Ph	H	H	H	H	Me	H	H	H	H	H	H	Ph	Me	Me
36-157	Me	H	H	H	H	H	Me	H	H	H	H	H	H	Me	Me
36-158	Me	H	H	H	H	H	Me	Me	H	H	H	H	H	Me	Me
36-159	Me	H	H	H	H	H	Me	H	Me	H	H	H	H	Me	Me
36-160	Me	H	H	H	H	H	Me	H	H	Me	H	H	H	Me	Me
36-161	Me	H	H	H	H	H	Me	H	H	H	Me	H	H	Me	Me
36-162	Me	H	H	H	H	H	Me	H	H	H	H	Me	H	Me	Me
36-163	Me	H	H	H	H	H	Me	H	H	H	H	H	Me	Me	Me
36-164	Me	H	H	H	H	H	Me	Ph	H	H	H	H	H	Me	Me
36-165	Me	H	H	H	H	H	Me	H	Ph	H	H	H	H	Me	Me
36-166	Me	H	H	H	H	H	Me	H	H	Ph	H	H	H	Me	Me
36-167	Me	H	H	H	H	H	Me	H	H	H	Ph	H	H	Me	Me

TABLE 36-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-168	Me	H	H	H	H	H	Me	H	H	H	H	Ph	H	Me	Me
36-169	Me	H	H	H	H	H	Me	H	H	H	H	H	Ph	Me	Me
36-170	Ph	H	H	H	H	H	Me	H	H	H	H	H	H	Me	Me
36-171	Ph	H	H	H	H	H	Me	Me	H	H	H	H	H	Me	Me
36-172	Ph	H	H	H	H	H	Me	H	Me	H	H	H	H	Me	Me
36-173	Ph	H	H	H	H	H	Me	H	H	Me	H	H	H	Me	Me
36-174	Ph	H	H	H	H	H	Me	H	H	H	Me	H	H	Me	Me
36-175	Ph	H	H	H	H	H	Me	H	H	H	H	Me	H	Me	Me
36-176	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me	Me	Me
36-177	Ph	H	H	H	H	H	Me	Ph	H	H	H	H	H	Me	Me
36-178	Ph	H	H	H	H	H	Me	H	Ph	H	H	H	H	Me	Me
36-179	Ph	H	H	H	H	H	Me	H	H	Ph	H	H	H	Me	Me
36-180	Ph	H	H	H	H	H	Me	H	H	H	Ph	H	H	Me	Me
36-181	Ph	H	H	H	H	H	Me	H	H	H	H	Ph	H	Me	Me
36-182	Ph	H	H	H	H	H	Me	H	H	H	H	H	Ph	Me	Me
36-183	Me	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-184	Me	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-185	Me	Ph	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-186	Me	Ph	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-187	Me	Ph	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-188	Me	Ph	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-189	Me	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-190	Me	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-191	Me	Ph	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-192	Me	Ph	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-193	Me	Ph	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-194	Me	Ph	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-195	Me	Ph	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-196	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H	Me	Me
36-197	Ph	Ph	H	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-198	Ph	Ph	H	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-199	Ph	Ph	H	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-200	Ph	Ph	H	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-201	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-202	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-203	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-204	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-205	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-206	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-207	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-208	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-209	Me	H	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me
36-210	Me	H	Ph	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-211	Me	H	Ph	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-212	Me	H	Ph	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-213	Me	H	Ph	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-214	Me	H	Ph	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-215	Me	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-216	Me	H	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-217	Me	H	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-218	Me	H	Ph	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-219	Me	H	Ph	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-220	Me	H	Ph	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-221	Me	H	Ph	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-222	Ph	H	Ph	H	H	H	H	H	H	H	H	H	H	Me	Me
36-223	Ph	H	Ph	H	H	H	H	Me	H	H	H	H	H	Me	Me
36-224	Ph	H	Ph	H	H	H	H	H	Me	H	H	H	H	Me	Me
36-225	Ph	H	Ph	H	H	H	H	H	H	Me	H	H	H	Me	Me
36-226	Ph	H	Ph	H	H	H	H	H	H	H	Me	H	H	Me	Me
36-227	Ph	H	Ph	H	H	H	H	H	H	H	H	Me	H	Me	Me
36-228	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me	Me
36-229	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	Me
36-230	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	Me
36-231	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H	H	Me	Me
36-232	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H	H	Me	Me
36-233	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph	H	Me	Me
36-234	Ph	H	Ph	H	H	H	H	H	H	H	H	H	Ph	Me	Me
36-235	Me	H	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me
36-236	Me	H	H	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
36-237	Me	H	H	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
36-238	Me	H	H	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
36-239	Me	H	H	Ph	H	H	H	H	H	H	Me	H	H	Me	Me
36-240	Me	H	H	Ph	H	H	H	H	H	H	H	Me	H	Me	Me
36-241	Me	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me	Me
36-242	Me	H	H	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
36-243	Me	H	H	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
36-244	Me	H	H	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
36-245	Me	H	H	Ph	H	H	H	H	H	H	Ph	H	H	Me	Me

TABLE 36-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-246	Me	H	H	Ph	H	H	H	H	H	H	H	Ph	H	Me	Me
36-247	Me	H	H	Ph	H	H	H	H	H	H	H	H	Ph	Me	Me
36-248	Ph	H	H	Ph	H	H	H	H	H	H	H	H	H	Me	Me
36-249	Ph	H	H	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
36-250	Ph	H	H	Ph	H	H	H	H	Me	H	H	H	H	Me	Me
36-251	Ph	H	H	Ph	H	H	H	H	H	Me	H	H	H	Me	Me
36-252	Ph	H	H	Ph	H	H	H	H	H	H	Me	H	H	Me	Me
36-253	Ph	H	H	Ph	H	H	H	H	H	H	H	Me	H	Me	Me
36-254	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me	Me
36-255	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
36-256	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H	H	Me	Me
36-257	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H	H	Me	Me
36-258	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H	H	Me	Me
36-259	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph	H	Me	Me
36-260	Ph	H	H	Ph	H	H	H	H	H	H	H	H	Ph	Me	Me
36-261	Me	H	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me
36-262	Me	H	H	H	Ph	H	H	Me	H	H	H	H	H	Me	Me
36-263	Me	H	H	H	Ph	H	H	H	Me	H	H	H	H	Me	Me
36-264	Me	H	H	H	Ph	H	H	H	H	Me	H	H	H	Me	Me
36-265	Me	H	H	H	Ph	H	H	H	H	H	Me	H	H	Me	Me
36-266	Me	H	H	H	Ph	H	H	H	H	H	H	Me	H	Me	Me
36-267	Me	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me	Me
36-268	Me	H	H	H	Ph	H	H	Ph	H	H	H	H	H	Me	Me
36-269	Me	H	H	H	Ph	H	H	H	Ph	H	H	H	H	Me	Me
36-270	Me	H	H	H	Ph	H	H	H	H	Ph	H	H	H	Me	Me
36-271	Me	H	H	H	Ph	H	H	H	H	H	Ph	H	H	Me	Me
36-272	Me	H	H	H	Ph	H	H	H	H	H	H	Ph	H	Me	Me
36-273	Me	H	H	H	Ph	H	H	H	H	H	H	H	Ph	Me	Me
36-274	Ph	H	H	H	Ph	H	H	H	H	H	H	H	H	Me	Me
36-275	Ph	H	H	H	Ph	H	H	Me	H	H	H	H	H	Me	Me
36-276	Ph	H	H	H	Ph	H	H	H	Me	H	H	H	H	Me	Me
36-277	Ph	H	H	H	Ph	H	H	H	H	Me	H	H	H	Me	Me
36-278	Ph	H	H	H	Ph	H	H	H	H	H	Me	H	H	Me	Me
36-279	Ph	H	H	H	Ph	H	H	H	H	H	H	Me	H	Me	Me
36-280	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me	Me
36-281	Ph	H	H	H	Ph	H	H	Ph	H	H	H	H	H	Me	Me
36-282	Ph	H	H	H	Ph	H	H	H	Ph	H	H	H	H	Me	Me
36-283	Ph	H	H	H	Ph	H	H	H	H	Ph	H	H	H	Me	Me
36-284	Ph	H	H	H	Ph	H	H	H	H	H	Ph	H	H	Me	Me
36-285	Ph	H	H	H	Ph	H	H	H	H	H	H	Ph	H	Me	Me
36-286	Ph	H	H	H	Ph	H	H	H	H	H	H	H	Ph	Me	Me
36-287	Me	H	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me
36-288	Me	H	H	H	H	Ph	H	Me	H	H	H	H	H	Me	Me
36-289	Me	H	H	H	H	Ph	H	H	Me	H	H	H	H	Me	Me
36-290	Me	H	H	H	H	Ph	H	H	H	Me	H	H	H	Me	Me
36-291	Me	H	H	H	H	Ph	H	H	H	H	Me	H	H	Me	Me
36-292	Me	H	H	H	H	Ph	H	H	H	H	H	Me	H	Me	Me
36-293	Me	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me	Me
36-294	Me	H	H	H	H	Ph	H	Ph	H	H	H	H	H	Me	Me
36-295	Me	H	H	H	H	Ph	H	H	Ph	H	H	H	H	Me	Me
36-296	Me	H	H	H	H	Ph	H	H	H	Ph	H	H	H	Me	Me
36-297	Me	H	H	H	H	Ph	H	H	H	H	Ph	H	H	Me	Me
36-298	Me	H	H	H	H	Ph	H	H	H	H	H	Ph	H	Me	Me
36-299	Me	H	H	H	H	Ph	H	H	H	H	H	H	Ph	Me	Me
36-300	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H	Me	Me
36-301	Ph	H	H	H	H	Ph	H	Me	H	H	H	H	H	Me	Me
36-302	Ph	H	H	H	H	Ph	H	H	Me	H	H	H	H	Me	Me
36-303	Ph	H	H	H	H	Ph	H	H	H	Me	H	H	H	Me	Me
36-304	Ph	H	H	H	H	Ph	H	H	H	H	Me	H	H	Me	Me
36-305	Ph	H	H	H	H	Ph	H	H	H	H	H	Me	H	Me	Me
36-306	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me	Me
36-307	Ph	H	H	H	H	Ph	H	Ph	H	H	H	H	H	Me	Me
36-308	Ph	H	H	H	H	Ph	H	H	Ph	H	H	H	H	Me	Me
36-309	Ph	H	H	H	H	Ph	H	H	H	Ph	H	H	H	Me	Me
36-310	Ph	H	H	H	H	Ph	H	H	H	H	Ph	H	H	Me	Me
36-311	Ph	H	H	H	H	Ph	H	H	H	H	H	Ph	H	Me	Me
36-312	Ph	H	H	H	H	Ph	H	H	H	H	H	H	Ph	Me	Me
36-313	Me	H	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me
36-314	Me	H	H	H	H	H	Ph	Me	H	H	H	H	H	Me	Me
36-315	Me	H	H	H	H	H	Ph	H	Me	H	H	H	H	Me	Me
36-316	Me	H	H	H	H	H	Ph	H	H	Me	H	H	H	Me	Me
36-317	Me	H	H	H	H	H	Ph	H	H	H	Me	H	H	Me	Me
36-318	Me	H	H	H	H	H	Ph	H	H	H	H	Me	H	Me	Me
36-319	Me	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me	Me
36-320	Me	H	H	H	H	H	Ph	Ph	H	H	H	H	H	Me	Me
36-321	Me	H	H	H	H	H	Ph	H	Ph	H	H	H	H	Me	Me
36-322	Me	H	H	H	H	H	Ph	H	H	Ph	H	H	H	Me	Me
36-323	Me	H	H	H	H	H	Ph	H	H	H	Ph	H	H	Me	Me

TABLE 36-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Ra6	Ra7	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
36-324	Me	H	H	H	H	H	Ph	H	H	H	H	Ph	H	Me	Me
36-325	Me	H	H	H	H	H	Ph	H	H	H	H	H	Ph	Me	Me
36-326	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H	Me	Me
36-327	Ph	H	H	H	H	H	Ph	Me	H	H	H	H	H	Me	Me
36-328	Ph	H	H	H	H	H	Ph	H	Me	H	H	H	H	Me	Me
36-329	Ph	H	H	H	H	H	Ph	H	H	Me	H	H	H	Me	Me
36-330	Ph	H	H	H	H	H	Ph	H	H	H	Me	H	H	Me	Me
36-331	Ph	H	H	H	H	H	Ph	H	H	H	H	Me	H	Me	Me
36-332	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Me	Me	Me
36-333	Ph	H	H	H	H	H	Ph	Ph	H	H	H	H	H	Me	Me
36-334	Ph	H	H	H	H	H	Ph	H	Ph	H	H	H	H	Me	Me
36-335	Ph	H	H	H	H	H	Ph	H	H	Ph	H	H	H	Me	Me
36-336	Ph	H	H	H	H	H	Ph	H	H	H	Ph	H	H	Me	Me
36-337	Ph	H	H	H	H	H	Ph	H	H	H	H	Ph	H	Me	Me
36-338	Ph	H	H	H	H	H	Ph	H	H	H	H	H	Ph	Me	Me

TABLE 37

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
37-1	Me	Me	Me	H	H	H	H	H	H	Me	Me
37-2	Me	Me	Me	Me	H	H	H	H	H	Me	Me
37-3	Me	Me	Me	H	Me	H	H	H	H	Me	Me
37-4	Me	Me	Me	H	H	Me	H	H	H	Me	Me
37-5	Me	Me	Me	H	H	H	Me	H	H	Me	Me
37-6	Me	Me	Me	H	H	H	H	Me	H	Me	Me
37-7	Me	Me	Me	H	H	H	H	H	Me	Me	Me
37-8	Me	Me	Me	Ph	H	H	H	H	H	Me	Me
37-9	Me	Me	Me	H	Ph	H	H	H	H	Me	Me
37-10	Me	Me	Me	H	H	Ph	H	H	H	Me	Me
37-11	Me	Me	Me	H	H	H	Ph	H	H	Me	Me
37-12	Me	Me	Me	H	H	H	H	Ph	H	Me	Me
37-13	Me	Me	Me	H	H	H	H	H	Ph	Me	Me
37-14	Ph	Me	Me	H	H	H	H	H	H	Me	Me
37-15	Ph	Me	Me	Me	H	H	H	H	H	Me	Me
37-16	Ph	Me	Me	H	Me	H	H	H	H	Me	Me
37-17	Ph	Me	Me	H	H	Me	H	H	H	Me	Me
37-18	Ph	Me	Me	H	H	H	Me	H	H	Me	Me
37-19	Ph	Me	Me	H	H	H	H	Me	H	Me	Me
37-20	Ph	Me	Me	H	H	H	H	H	Me	Me	Me
37-21	Ph	Me	Me	Ph	H	H	H	H	H	Me	Me
37-22	Ph	Me	Me	H	Ph	H	H	H	H	Me	Me
37-23	Ph	Me	Me	H	H	Ph	H	H	H	Me	Me
37-24	Ph	Me	Me	H	H	H	Ph	H	H	Me	Me
37-25	Ph	Me	Me	H	H	H	H	Ph	H	Me	Me
37-26	Ph	Me	Me	H	H	H	H	H	Ph	Me	Me
37-27	Me	Ph	Me	H	H	H	H	H	H	Me	Me
37-28	Me	Ph	Me	Me	H	H	H	H	H	Me	Me
37-29	Me	Ph	Me	H	Me	H	H	H	H	Me	Me
37-30	Me	Ph	Me	H	H	Me	H	H	H	Me	Me
37-31	Me	Ph	Me	H	H	H	Me	H	H	Me	Me
37-32	Me	Ph	Me	H	H	H	H	Me	H	Me	Me
37-33	Me	Ph	Me	H	H	H	H	H	Me	Me	Me
37-34	Me	Ph	Me	Ph	H	H	H	H	H	Me	Me
37-35	Me	Ph	Me	H	Ph	H	H	H	H	Me	Me
37-36	Me	Ph	Me	H	H	Ph	H	H	H	Me	Me
37-37	Me	Ph	Me	H	H	H	Ph	H	H	Me	Me
37-38	Me	Ph	Me	H	H	H	H	Ph	H	Me	Me
37-39	Me	Ph	Me	H	H	H	H	H	Ph	Me	Me
37-40	Ph	Ph	Me	H	H	H	H	H	H	Me	Me
37-41	Ph	Ph	Me	Me	H	H	H	H	H	Me	Me
37-42	Ph	Ph	Me	H	Me	H	H	H	H	Me	Me
37-43	Ph	Ph	Me	H	H	Me	H	H	H	Me	Me
37-44	Ph	Ph	Me	H	H	H	Me	H	H	Me	Me
37-45	Ph	Ph	Me	H	H	H	H	Me	H	Me	Me
37-46	Ph	Ph	Me	H	H	H	H	H	Me	Me	Me
37-47	Ph	Ph	Me	Ph	H	H	H	H	H	Me	Me
37-48	Ph	Ph	Me	H	Ph	H	H	H	H	Me	Me
37-49	Ph	Ph	Me	H	H	Ph	H	H	H	Me	Me
37-50	Ph	Ph	Me	H	H	H	Ph	H	H	Me	Me
37-51	Ph	Ph	Me	H	H	H	H	Ph	H	Me	Me
37-52	Ph	Ph	Me	H	H	H	H	H	Ph	Me	Me
37-53	Me	Me	Ph	H	H	H	H	H	H	Me	Me
37-54	Me	Me	Ph	Me	H	H	H	H	H	Me	Me
37-55	Me	Me	Ph	H	Me	H	H	H	H	Me	Me

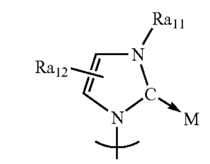
TABLE 37-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
37-56	Me	Me	Ph	H	H	Me	H	H	H	Me	Me
37-57	Me	Me	Ph	H	H	H	Me	H	H	Me	Me
37-58	Me	Me	Ph	H	H	H	H	Me	H	Me	Me
37-59	Me	Me	Ph	H	H	H	H	H	Me	Me	Me
37-60	Me	Me	Ph	Ph	H	H	H	H	H	Me	Me
37-61	Me	Me	Ph	H	Ph	H	H	H	H	Me	Me
37-62	Me	Me	Ph	H	H	Ph	H	H	H	Me	Me
37-63	Me	Me	Ph	H	H	H	Ph	H	H	Me	Me
37-64	Me	Me	Ph	H	H	H	H	Ph	H	Me	Me
37-65	Me	Me	Ph	H	H	H	H	H	Ph	Me	Me
37-66	Ph	Me	Ph	H	H	H	H	H	H	Me	Me
37-67	Ph	Me	Ph	Me	H	H	H	H	H	Me	Me
37-68	Ph	Me	Ph	H	Me	H	H	H	H	Me	Me
37-69	Ph	Me	Ph	H	H	Me	H	H	H	Me	Me
37-70	Ph	Me	Ph	H	H	H	Me	H	H	Me	Me
37-71	Ph	Me	Ph	H	H	H	H	Me	H	Me	Me
37-72	Ph	Me	Ph	H	H	H	H	H	Me	Me	Me
37-73	Ph	Me	Ph	Ph	H	H	H	H	H	Me	Me
37-74	Ph	Me	Ph	H	Ph	H	H	H	H	Me	Me
37-75	Ph	Me	Ph	H	H	Ph	H	H	H	Me	Me
37-76	Ph	Me	Ph	H	H	H	Ph	H	H	Me	Me
37-77	Ph	Me	Ph	H	H	H	H	Ph	H	Me	Me
37-78	Ph	Me	Ph	H	H	H	H	H	Ph	Me	Me
37-79	Me	Ph	Ph	H	H	H	H	H	H	Me	Me
37-80	Me	Ph	Ph	Me	H	H	H	H	H	Me	Me
37-81	Me	Ph	Ph	H	Me	H	H	H	H	Me	Me
37-82	Me	Ph	Ph	H	H	Me	H	H	H	Me	Me
37-83	Me	Ph	Ph	H	H	H	Me	H	H	Me	Me
37-84	Me	Ph	Ph	H	H	H	H	Me	H	Me	Me
37-85	Me	Ph	Ph	H	H	H	H	H	Me	Me	Me
37-86	Me	Ph	Ph	Ph	H	H	H	H	H	Me	Me
37-87	Me	Ph	Ph	H	Ph	H	H	H	H	Me	Me
37-88	Me	Ph	Ph	H	H	Ph	H	H	H	Me	Me
37-89	Me	Ph	Ph	H	H	H	Ph	H	H	Me	Me
37-90	Me	Ph	Ph	H	H	H	H	Ph	H	Me	Me
37-91	Me	Ph	Ph	H	H	H	H	H	Ph	Me	Me
37-92	Ph	Ph	Ph	H	H	H	H	H	H	Me	Me
37-93	Ph	Ph	Ph	Me	H	H	H	H	H	Me	Me
37-94	Ph	Ph	Ph	H	Me	H	H	H	H	Me	Me
37-95	Ph	Ph	Ph	H	H	Me	H	H	H	Me	Me
37-96	Ph	Ph	Ph	H	H	H	Me	H	H	Me	Me
37-97	Ph	Ph	Ph	H	H	H	H	Me	H	Me	Me
37-98	Ph	Ph	Ph	H	H	H	H	H	Me	Me	Me
37-99	Ph	Ph	Ph	Ph	H	H	H	H	H	Me	Me
37-100	Ph	Ph	Ph	H	Ph	H	H	H	H	Me	Me
37-101	Ph	Ph	Ph	H	H	Ph	H	H	H	Me	Me
37-102	Ph	Ph	Ph	H	H	H	Ph	H	H	Me	Me
37-103	Ph	Ph	Ph	H	H	H	H	Ph	H	Me	Me
37-104	Ph	Ph	Ph	H	H	H	H	H	Ph	Me	Me

TABLE 38

"A" part of ligand

A1



A2

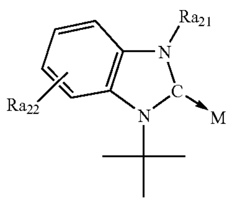
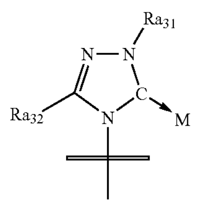


TABLE 38-continued

"A" part of ligand

A3



A4

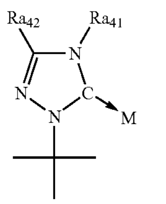


TABLE 38-continued

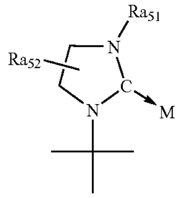
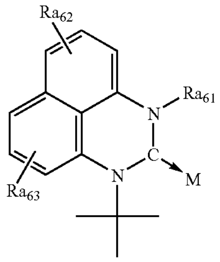
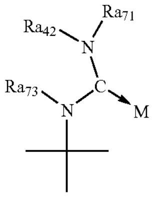
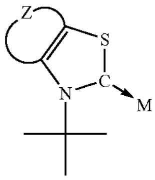
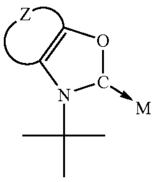
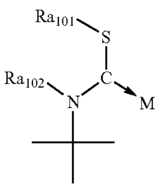
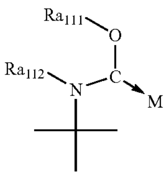
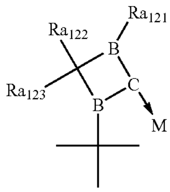
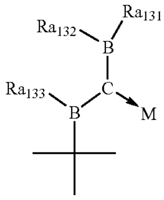
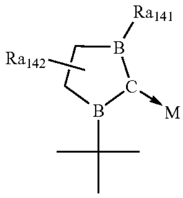
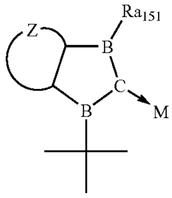
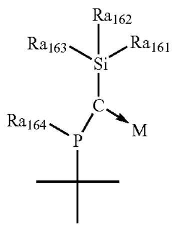
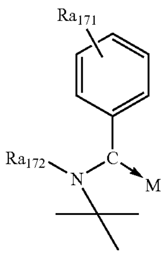
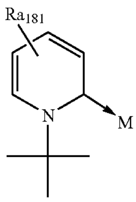
"A" part of ligand	
A5	
A6	
A7	
A8	
A9	
A10	
A11	
A12	
A13	
A14	
A15	
A16	
A17	
A18	

TABLE 38-continued

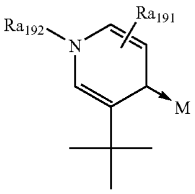
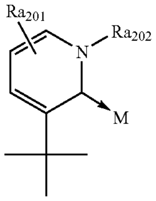
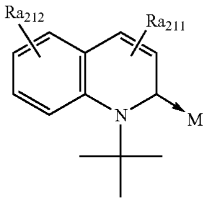
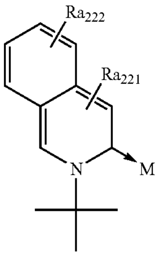
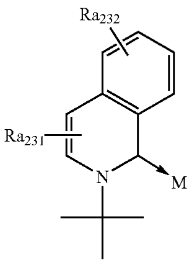
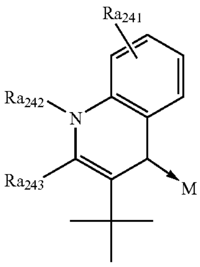
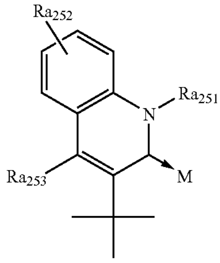
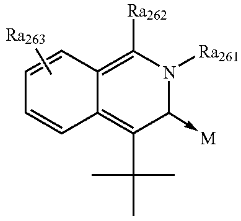
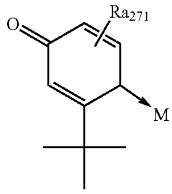
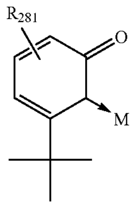
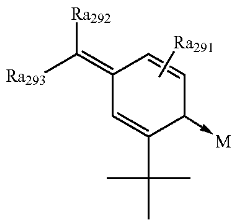
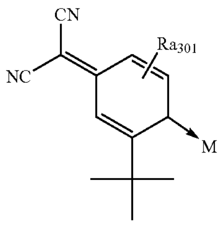
	"A" part of ligand
A19	
A20	
A21	
A22	
A23	
A24	
A25	
A26	
A27	
A28	
A29	
A30	

TABLE 38-continued

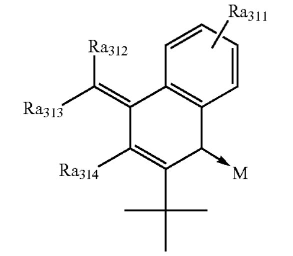
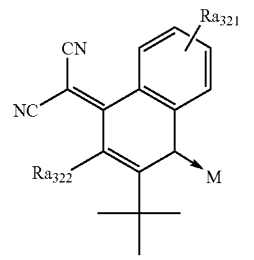
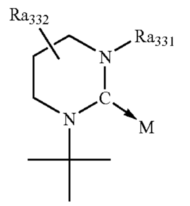
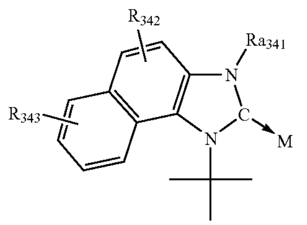
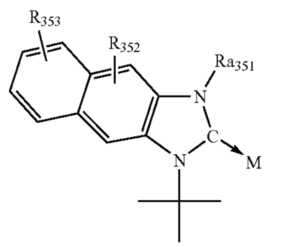
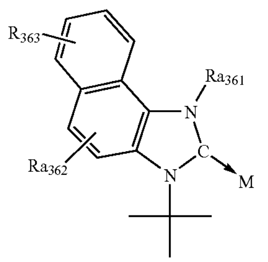
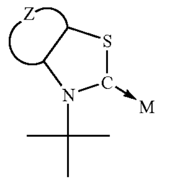
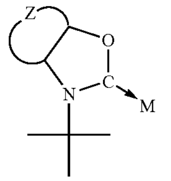
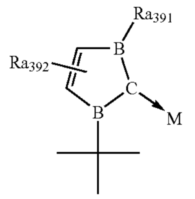
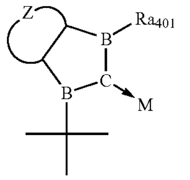
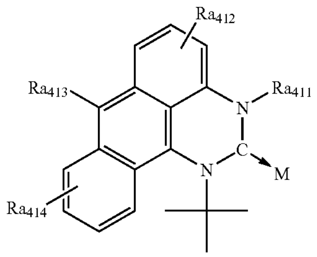
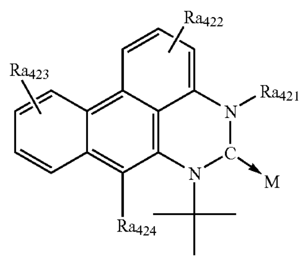
"A" part of ligand	
A31	
A32	
A33	
A34	
A35	
A36	

TABLE 38-continued

"A" part of ligand	
A37	
A38	
A39	
A40	
A41	
A42	

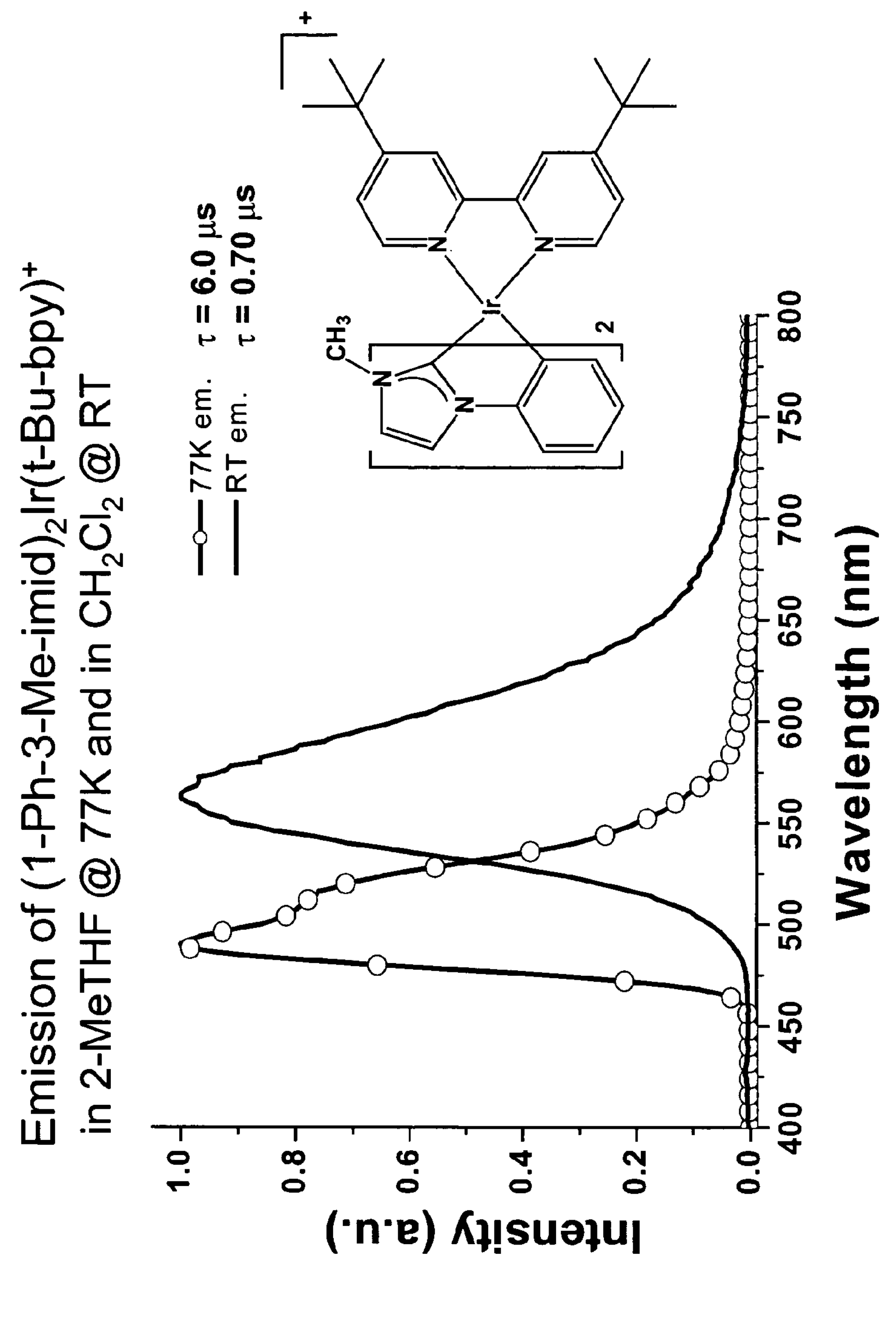

Emission of (1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$
in 2-MeTHF @ 77K and in CH_2Cl_2 @ RT
77K em. τ = 6.0 μs
RT em. τ = 0.70 μs
Intensity (a.u.)
1.0
0.8
0.6
0.4
0.2
0.0
400
450
500
550
600
650
700
750
800
Wavelength (nm)
CH_3
N
N
Ir
N
N
2
+

Figure 14

TABLE 38-continued

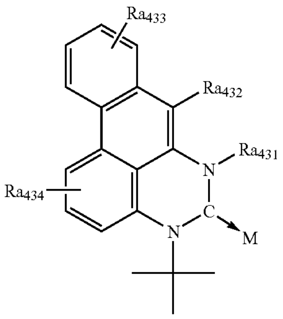
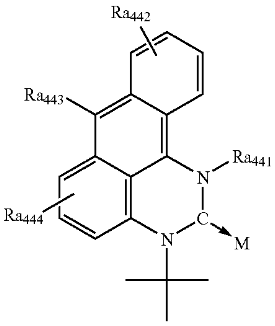
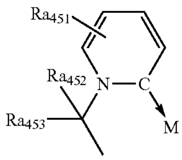
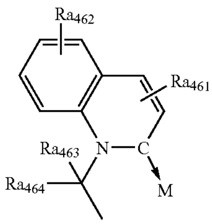
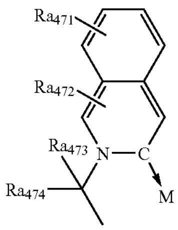
"A" part of ligand	
A43	
A44	
A45	
A46	
A47	

TABLE 39

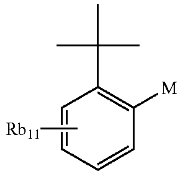
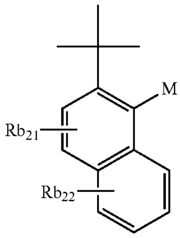
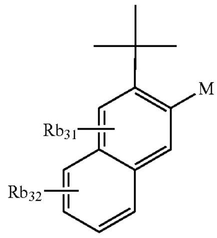
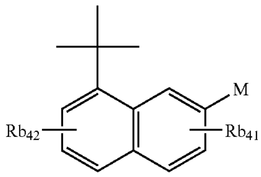
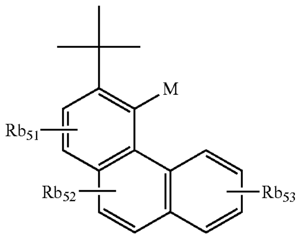
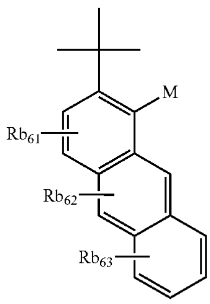
"B" part of ligand	
B1	
B2	
B3	
B4	
B5	
B6	

TABLE 39-continued

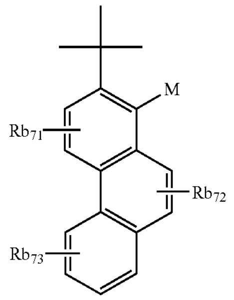
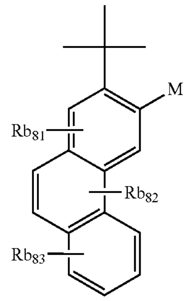
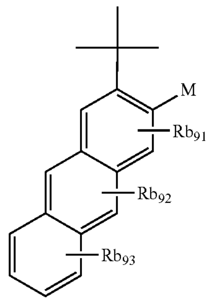
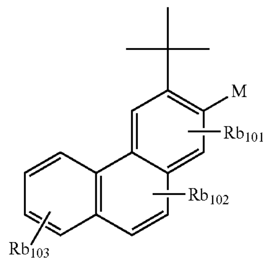
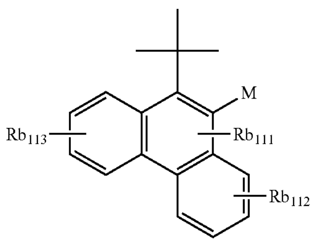
"B" part of ligand	
B7	
B8	
B9	
B10	
B11	

TABLE 39-continued

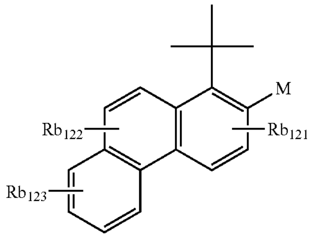
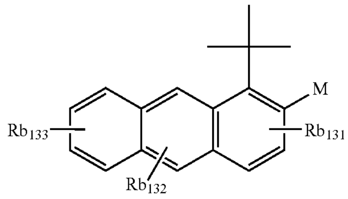
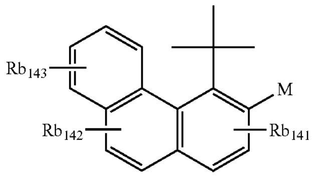
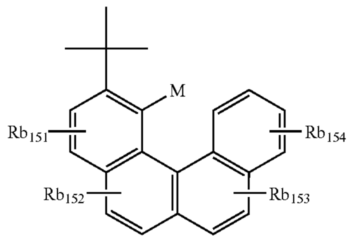
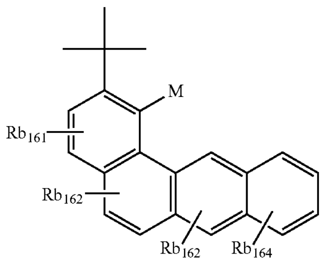
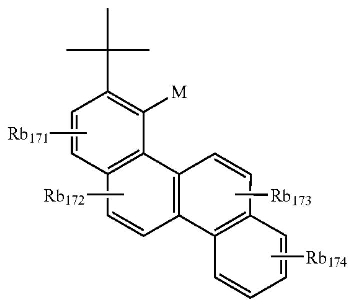
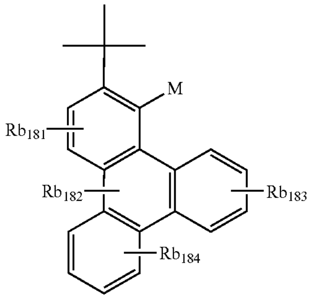
"B" part of ligand	
B12	
B13	
B14	
B15	
B16	
B17	

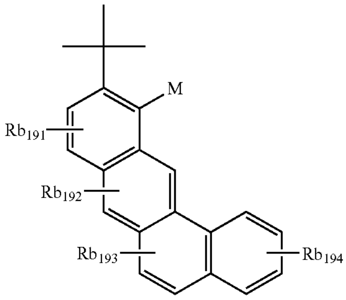
TABLE 39-continued

"B" part of ligand

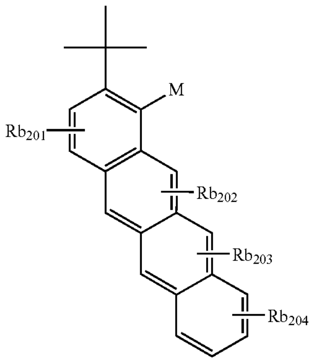
B18



B19



B20



B21

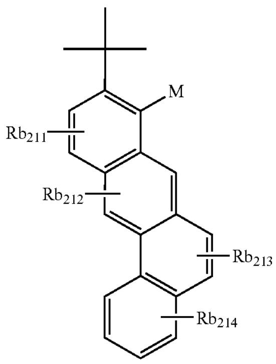
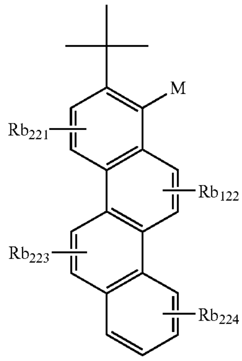


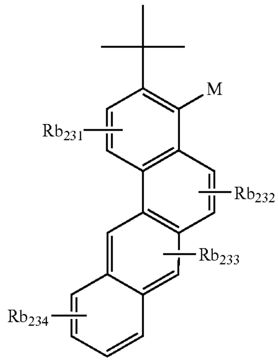
TABLE 39-continued

"B" part of ligand

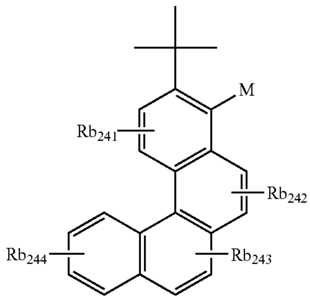
B22



B23



B24



B25

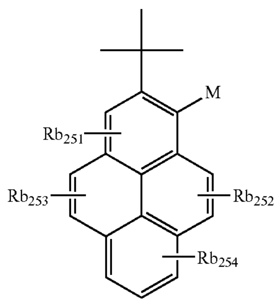


TABLE 39-continued

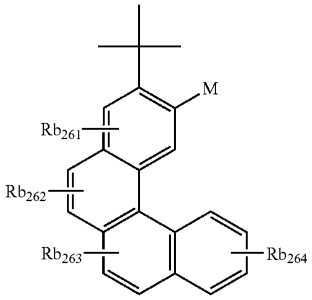
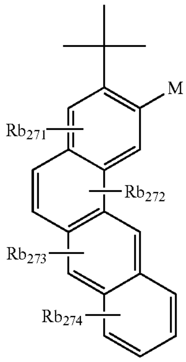
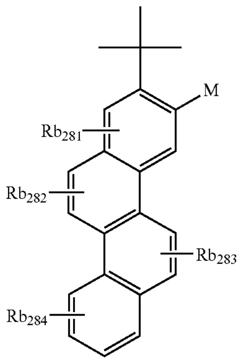
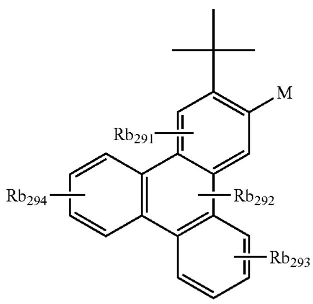
"B" part of ligand	
B26	
B27	
B28	
B29	

TABLE 39-continued

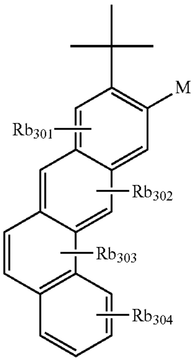
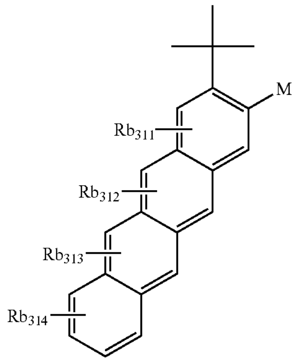
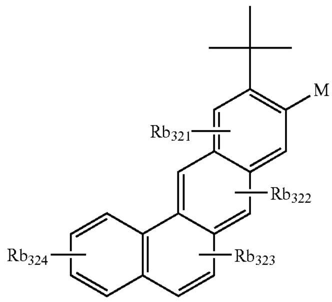
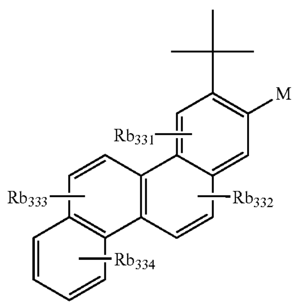
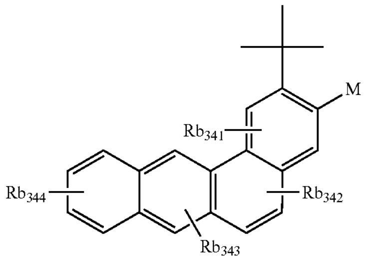
"B" part of ligand	
B30	
B31	
B32	
B33	

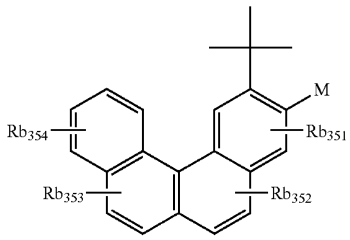
TABLE 39-continued

"B" part of ligand

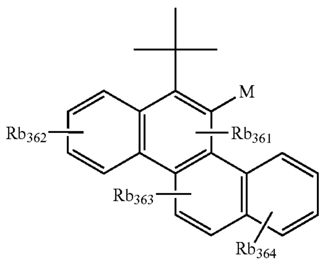
B34



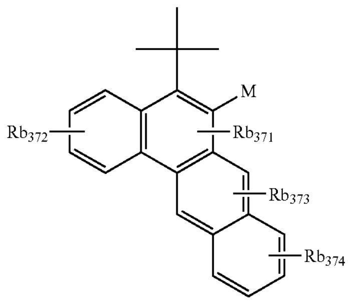
B35



B36



B37



B38

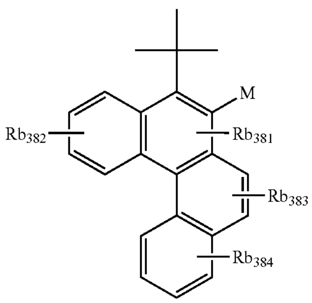
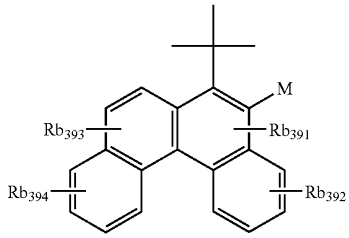


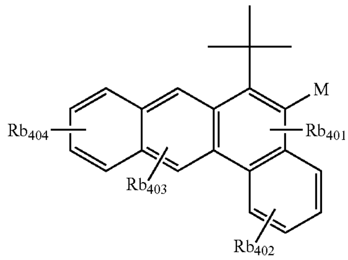
TABLE 39-continued

"B" part of ligand

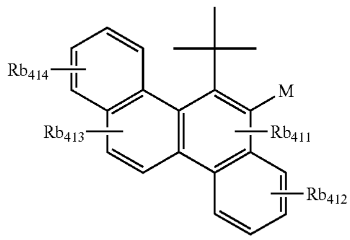
B39



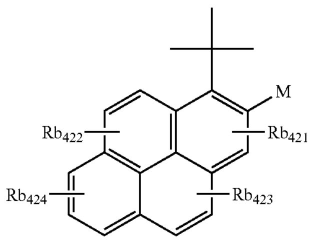
B40



B41



B42



B43

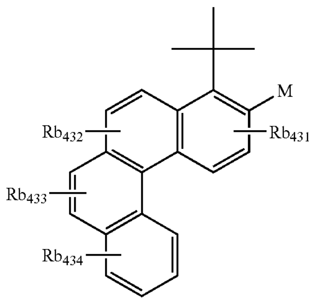


TABLE 39-continued

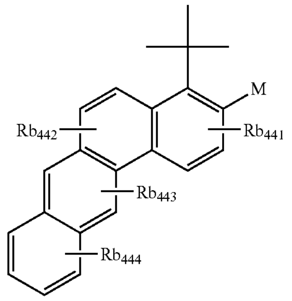
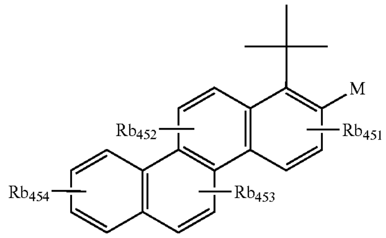
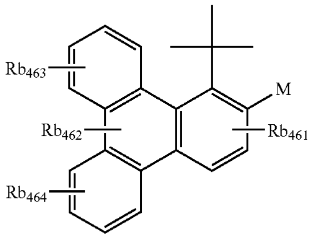
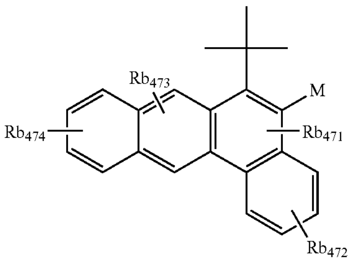
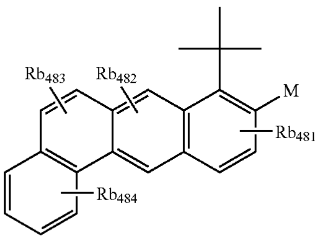
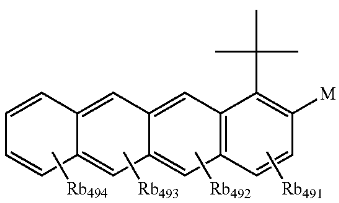
"B" part of ligand	
B44	
B45	
B46	
B47	
B48	
B49	

TABLE 39-continued

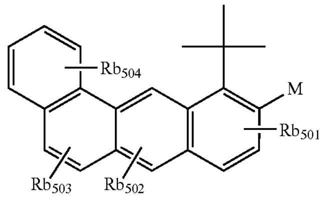
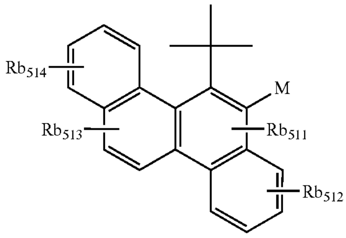
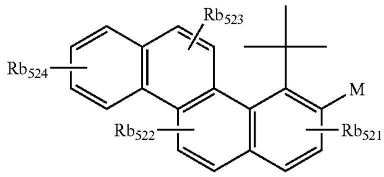
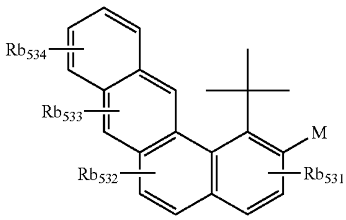
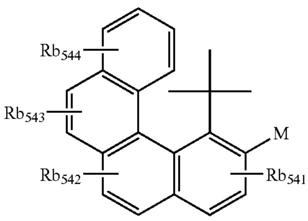
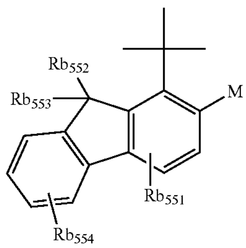
"B" part of ligand	
B50	
B51	
B52	
B53	
B54	
B55	

TABLE 39-continued

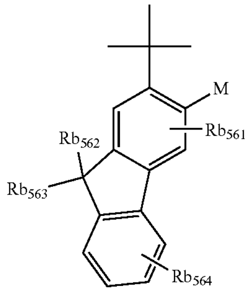
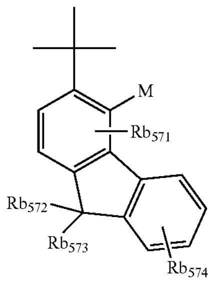
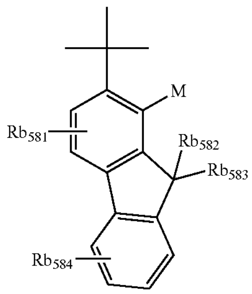
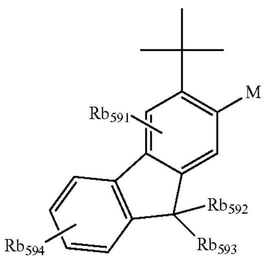
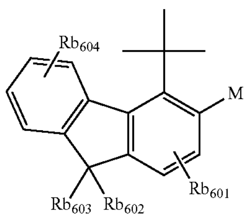
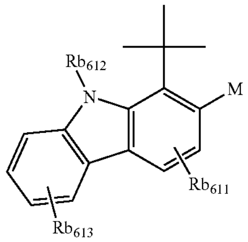
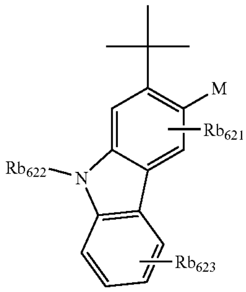
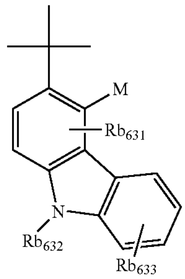
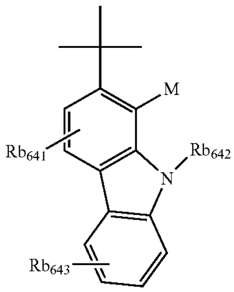
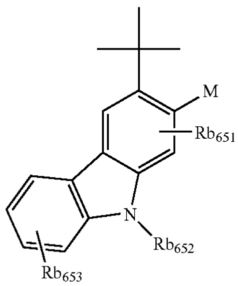
	"B" part of ligand
B56	
B57	
B58	
B59	
B60	
B61	
B62	
B63	
B64	
B65	

TABLE 39-continued

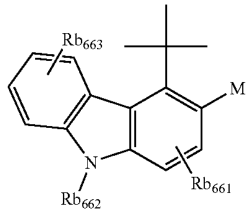
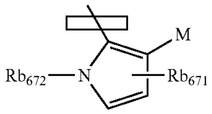
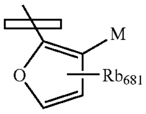
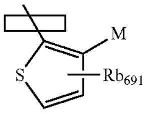
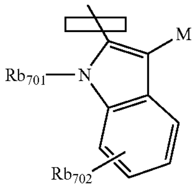
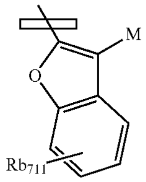
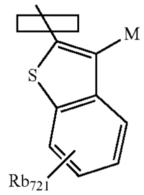
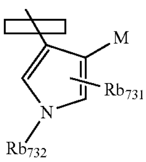
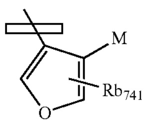
"B" part of ligand	
B66	
B67	
B68	
B69	
B70	
B71	
B72	
B73	
B74	

TABLE 39-continued

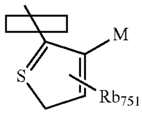
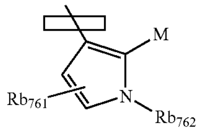
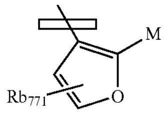
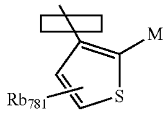
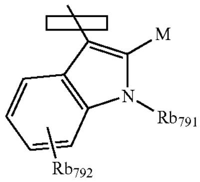
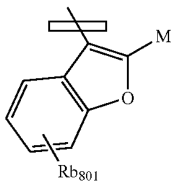
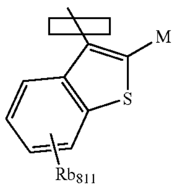
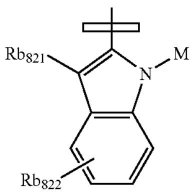
"B" part of ligand	
B75	
B76	
B77	
B78	
B79	
B80	
B81	
B82	

TABLE 39-continued

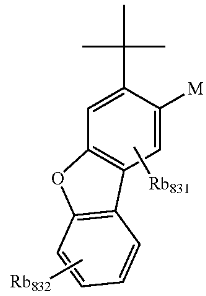
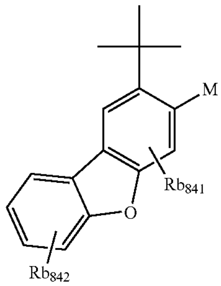
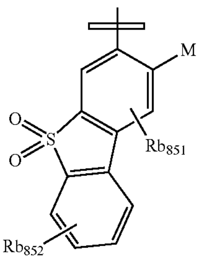
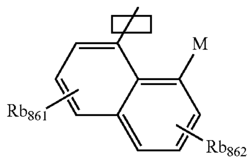
"B" part of ligand	
B83	
B84	
B85	
B86	

TABLE 40

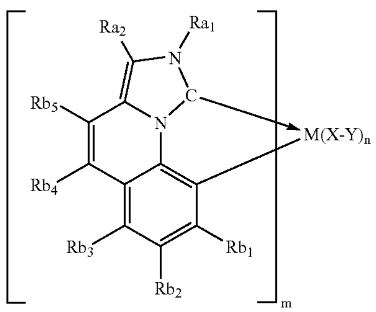
"C" Ligands	
C1	

TABLE 40-continued

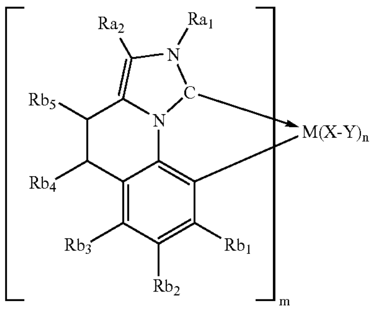
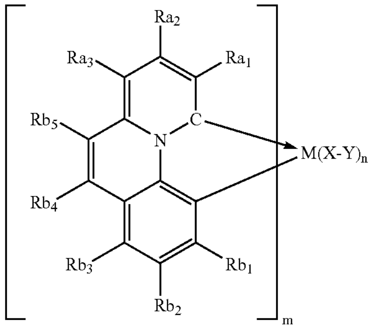
"C" Ligands	
C2	
C3	

TABLE 41

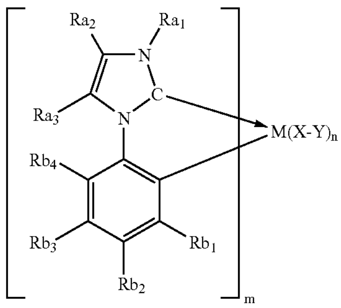
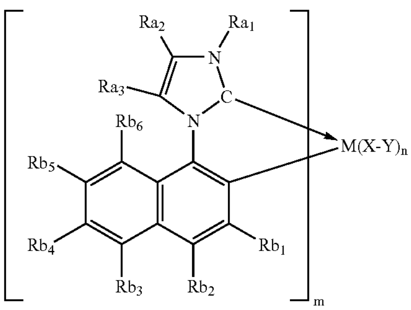
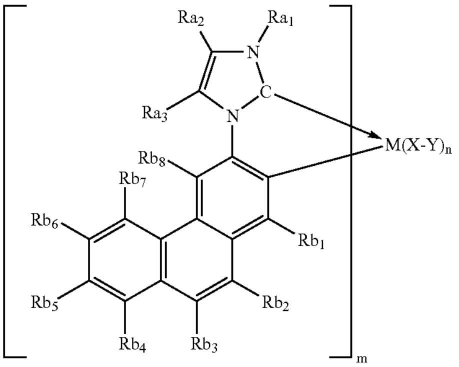
Preferred compounds	
A1 B1	
A1 B4	

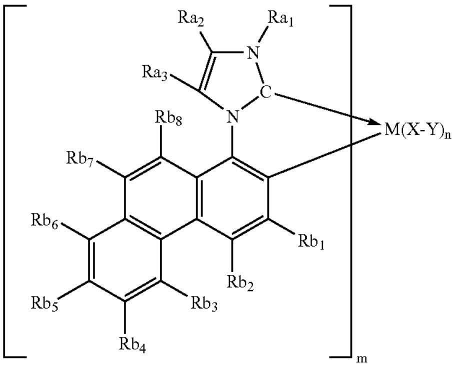
TABLE 41-continued

Preferred compounds

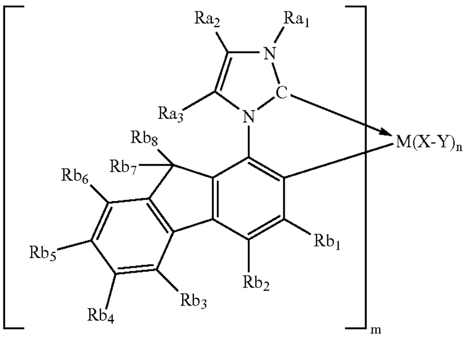
A1
B10



A1
B12



A1
B55



A1
B56

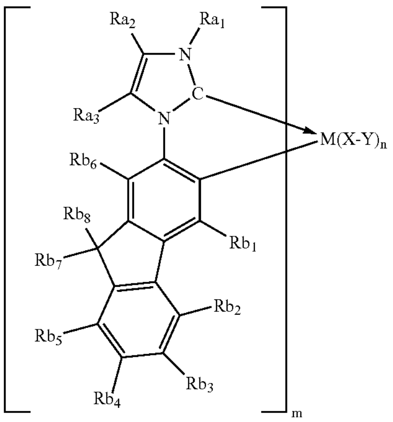
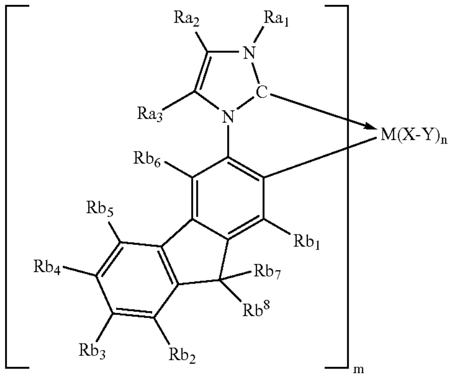


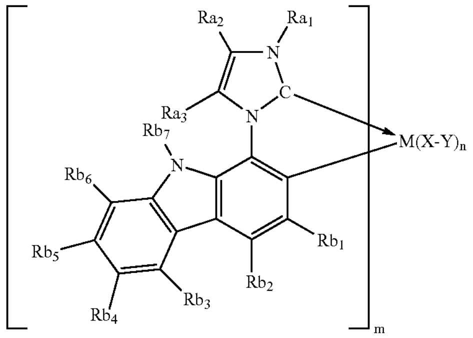
TABLE 41-continued

Preferred compounds

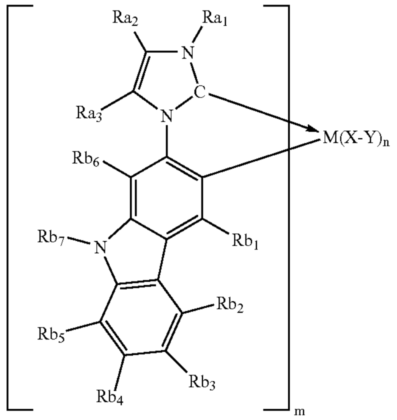
A1
B59



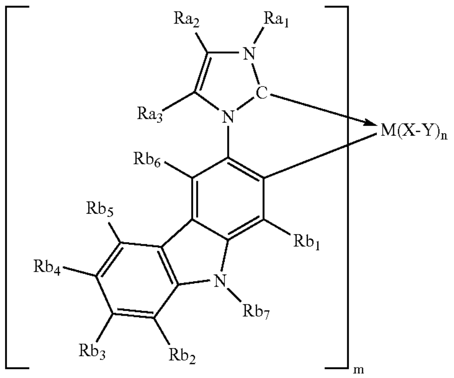
A1
B61

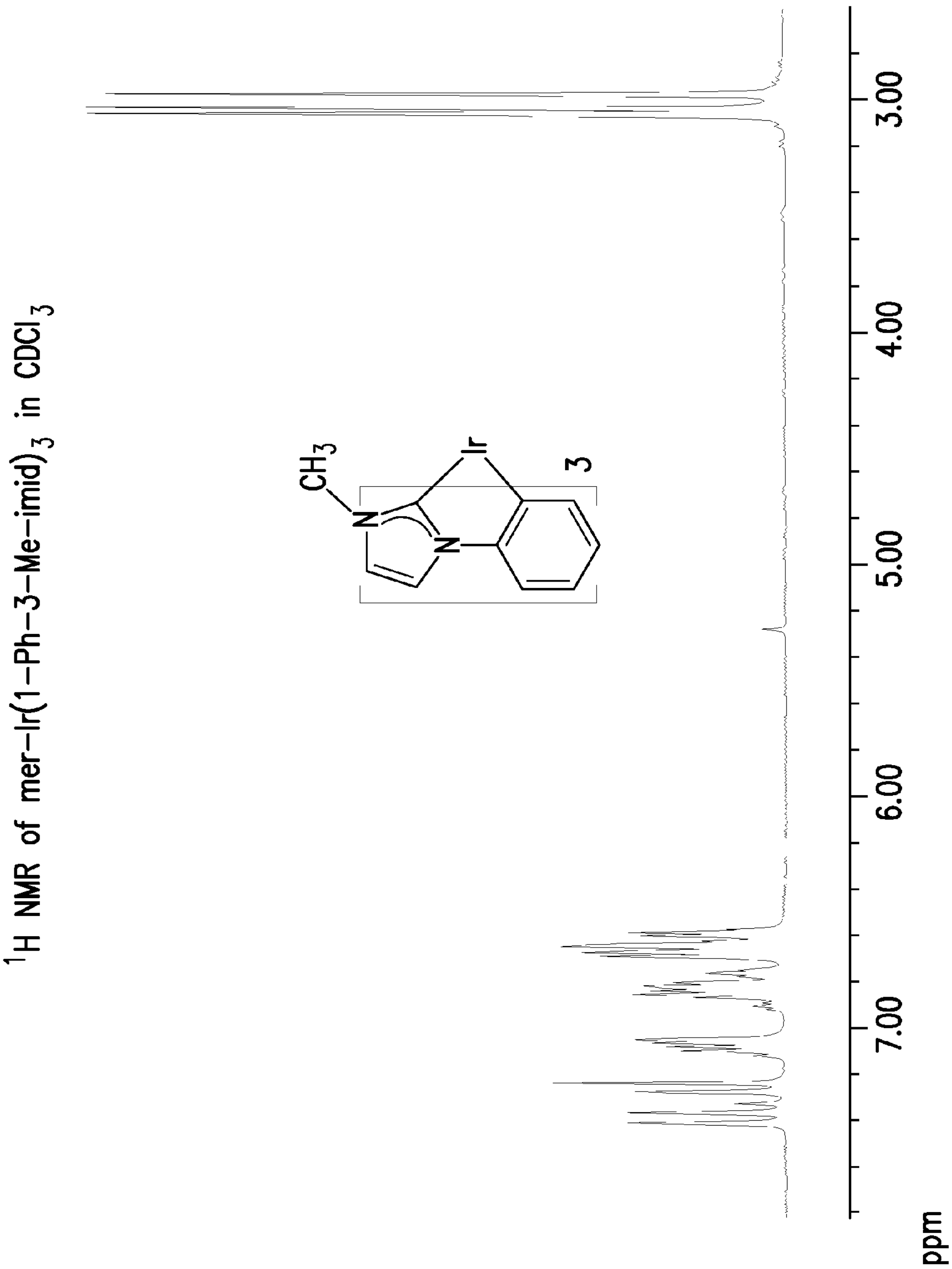


A1
B62



A1
B65





^1H NMR of mer–Ir(1–Ph–3–Me–imid)$_3$ in $CDCl_3$
CH_3
N
N
Ir
3
3.00
4.00
5.00
6.00
7.00
ppm

FIG. 15

TABLE 41-continued

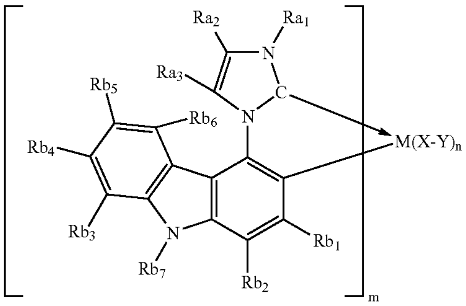
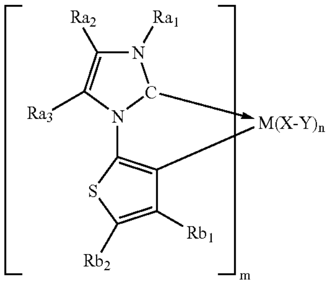
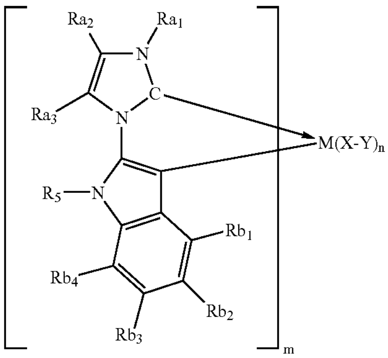
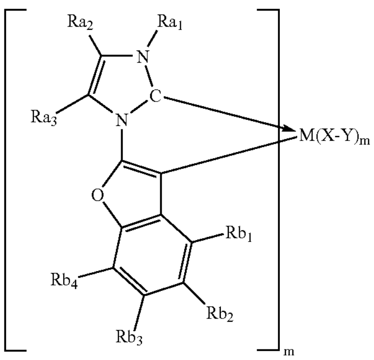
Preferred compounds	
A1 B66	
A1 B69	
A1 B70	
A1 B71	

TABLE 41-continued

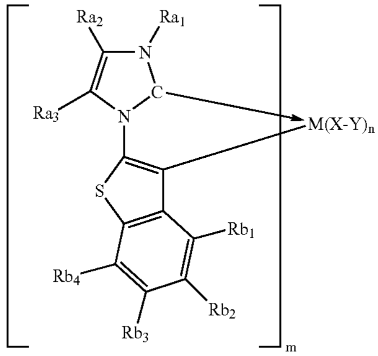
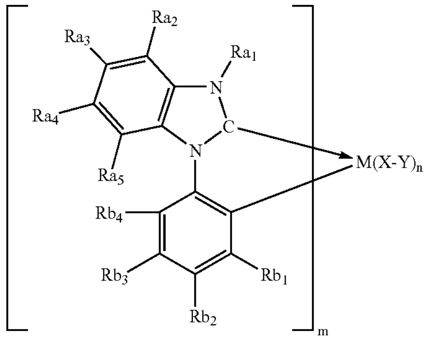
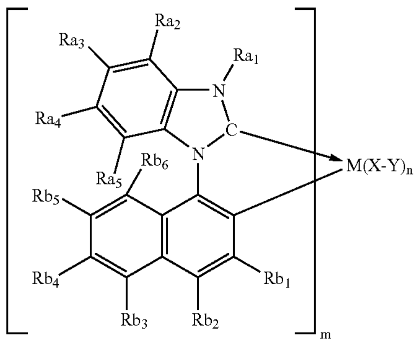
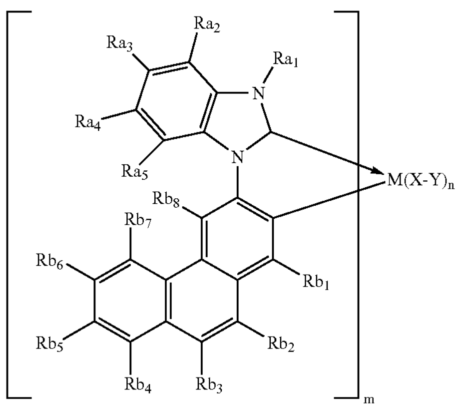
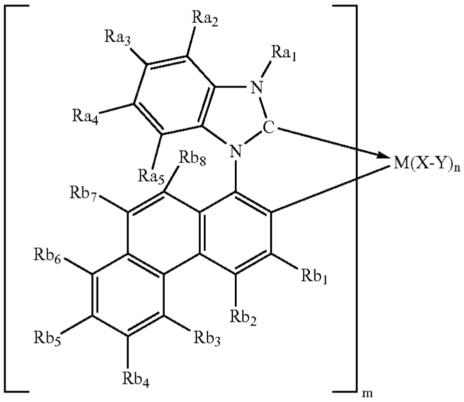
Preferred compounds	
A1 B72	
A2 B1	
A2 B4	
A2 B10	

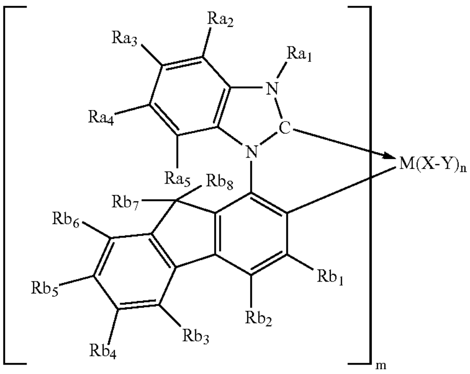
TABLE 41-continued

Preferred compounds

A2
B12



A2
B55



A2
B56

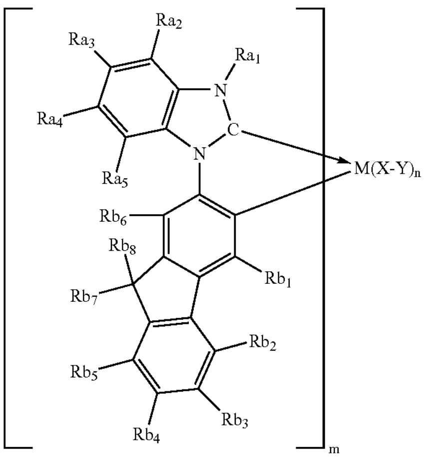
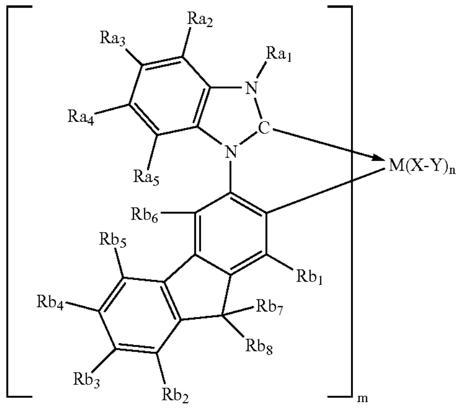


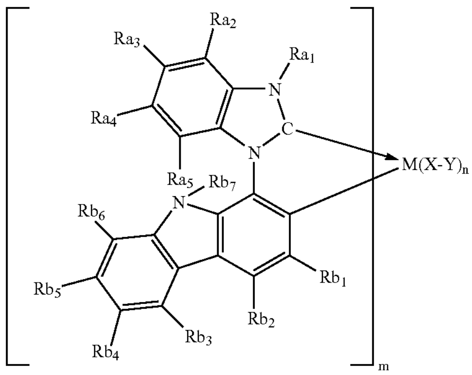
TABLE 41-continued

Preferred compounds

A2
B59



A2
B61



A2
B62

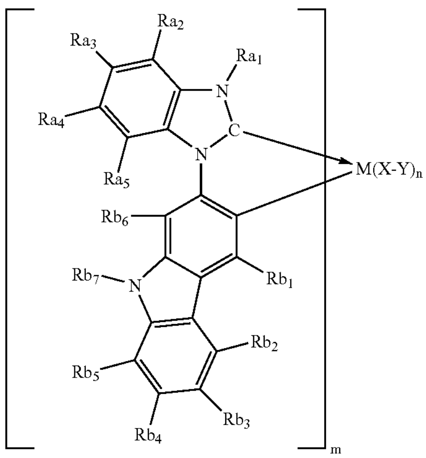
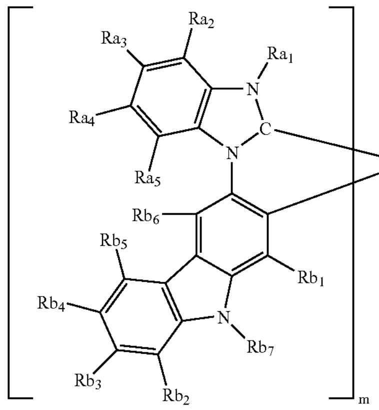


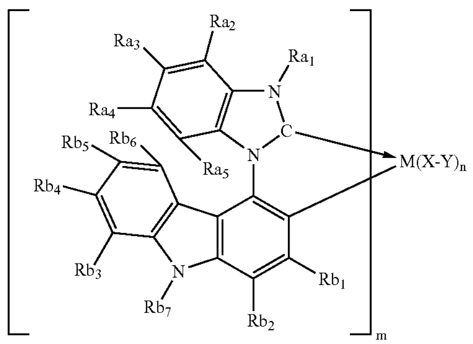
TABLE 41-continued

Preferred compounds

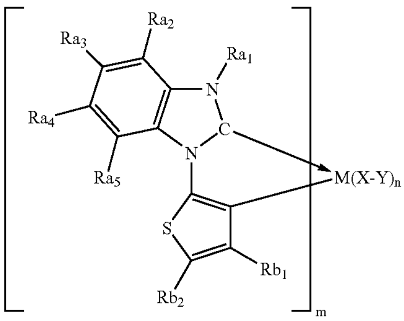
A2
B65



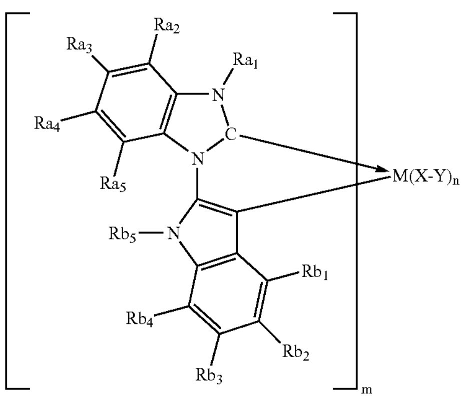
A2
B66



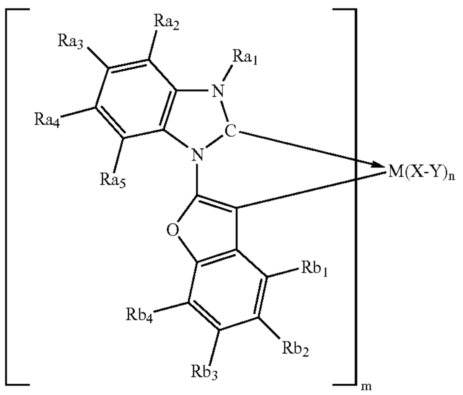
A2
B69



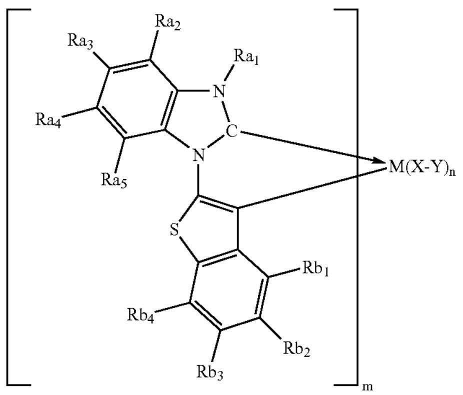
A2
B70



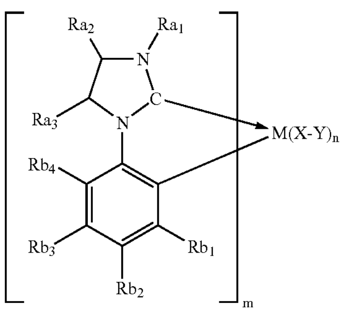
A2
B71



A2
B72



A5
B1



A5
B4

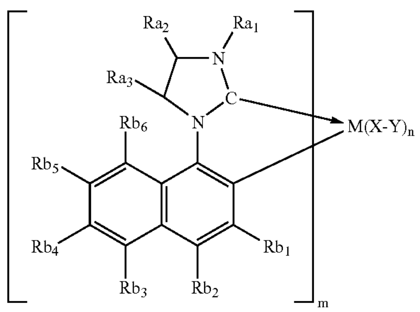
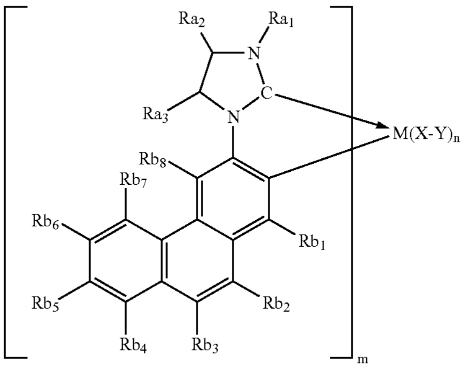


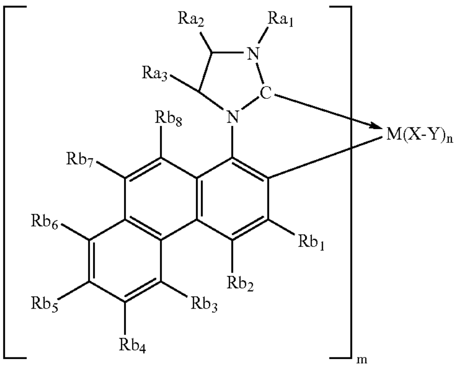
TABLE 41-continued

Preferred compounds

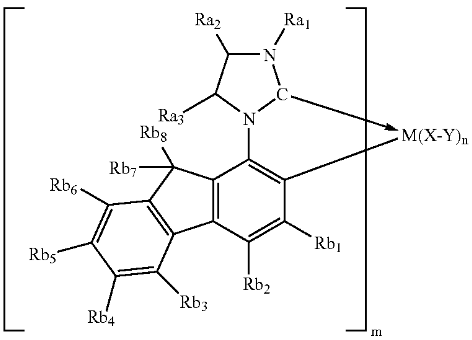
A5
B10



A5
B12



A5
B55



A5
B56

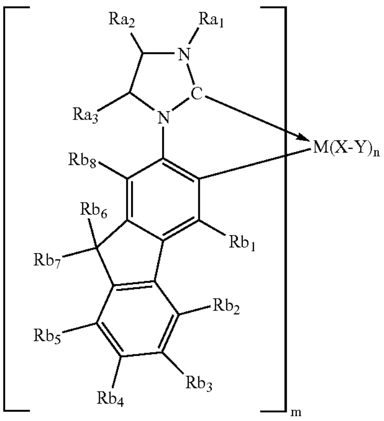
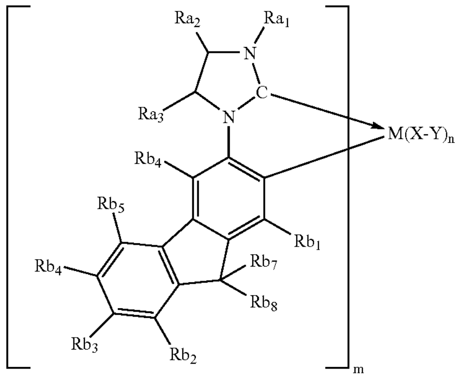


TABLE 41-continued

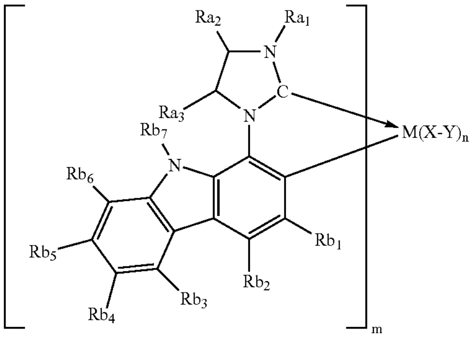
Preferred compounds

A5
B59

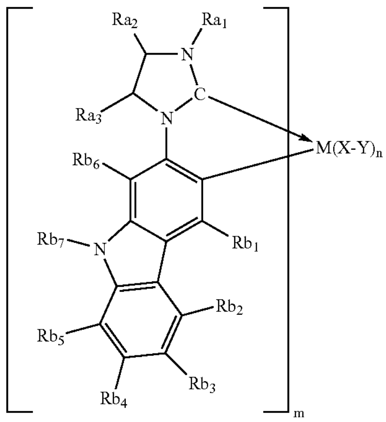


A5B59

A5
B61



A5
B62



A5
B65

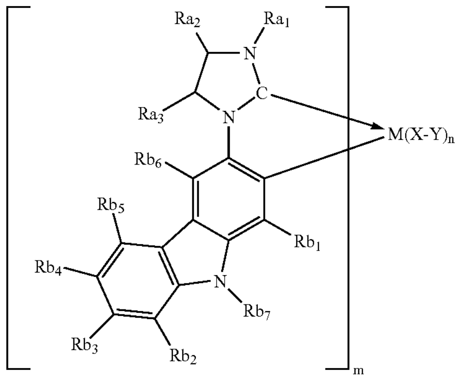
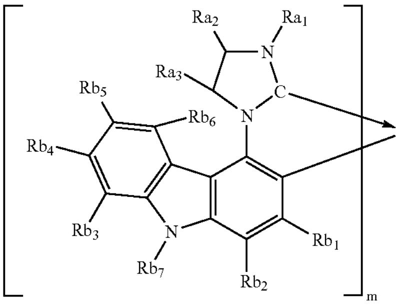


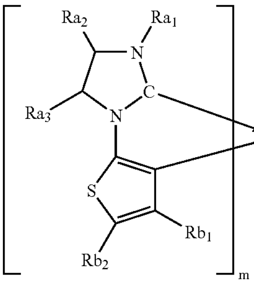
TABLE 41-continued

Preferred compounds

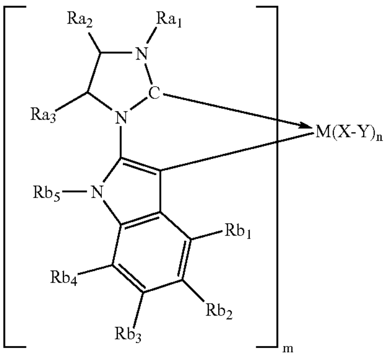
A5
B66



A5
B69



A5
B70



A5
B71

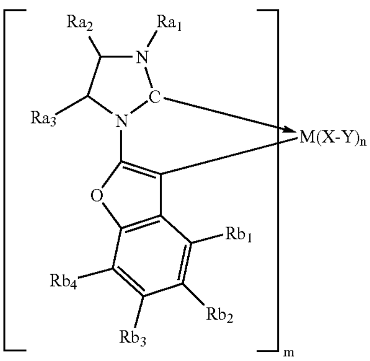
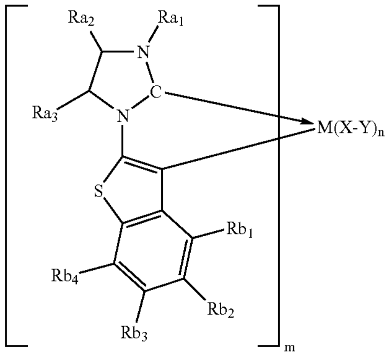


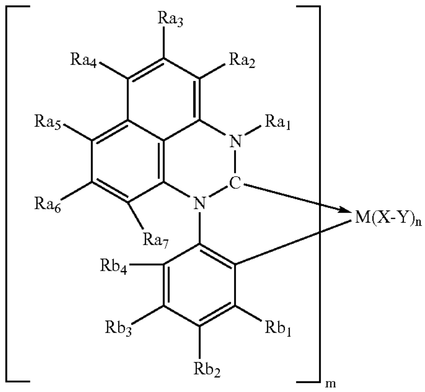
TABLE 41-continued

Preferred compounds

A5
B72



A6
B1



A6
B4

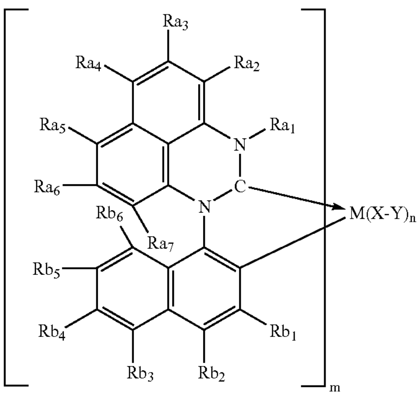
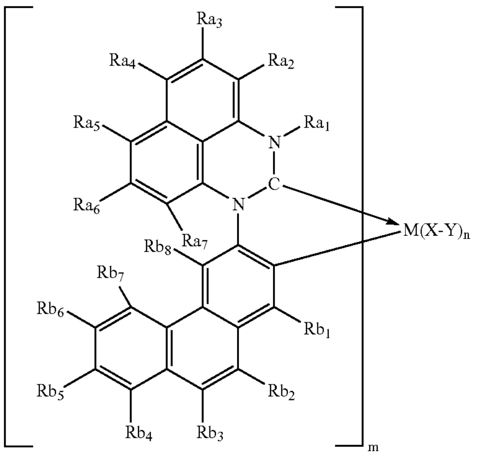


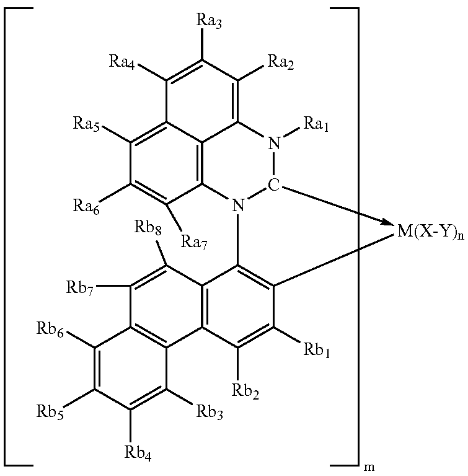
TABLE 41-continued

Preferred compounds

A6
B10



A6
B12



A6
B55

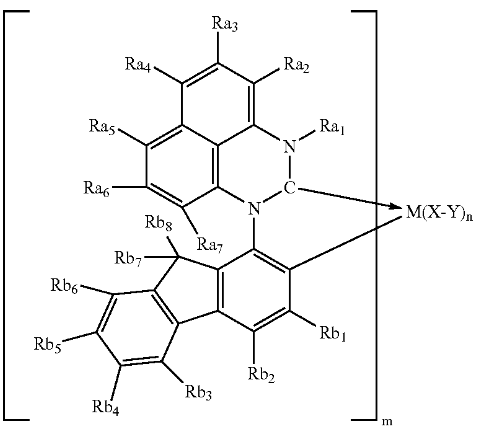
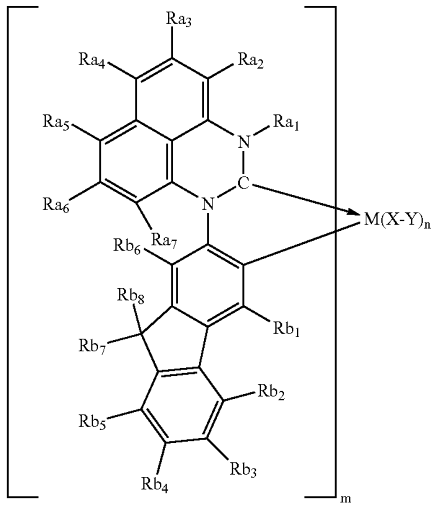


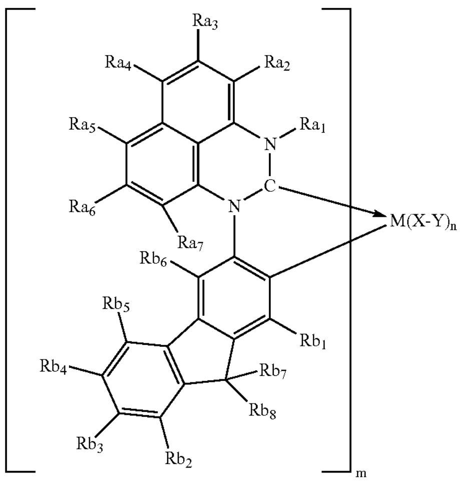
TABLE 41-continued

Preferred compounds

A6
B56



A6
B59



A6
B61

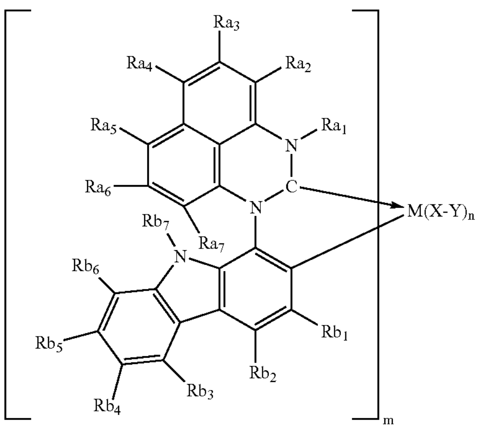
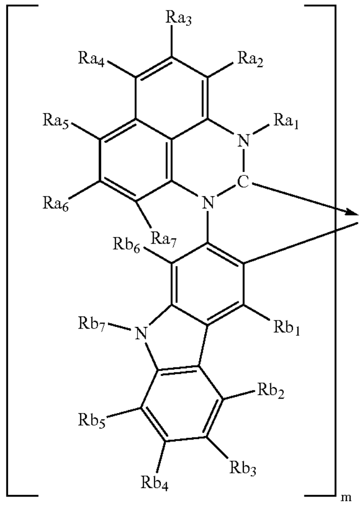


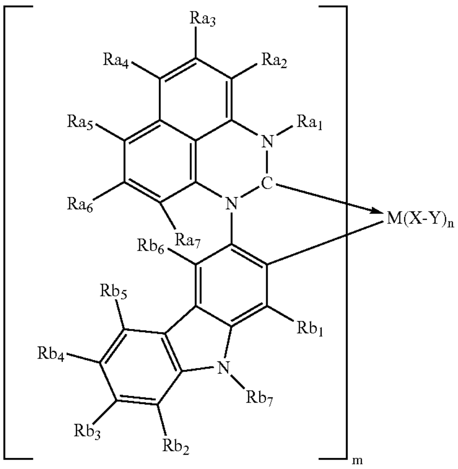
TABLE 41-continued

Preferred compounds

A6
B62



A6
B65



A6
B66

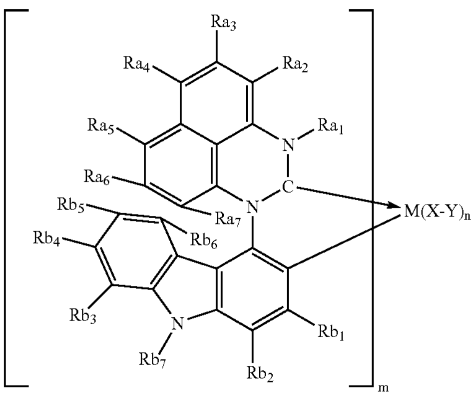
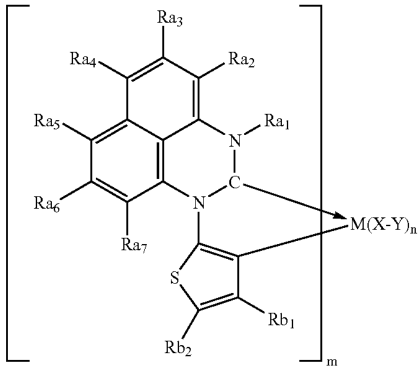


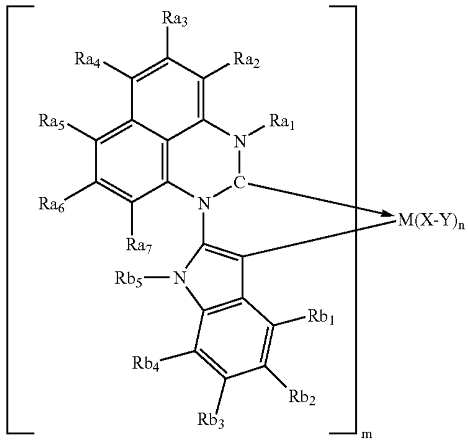
TABLE 41-continued

Preferred compounds

A6
B69



A6
B70



A6
B71

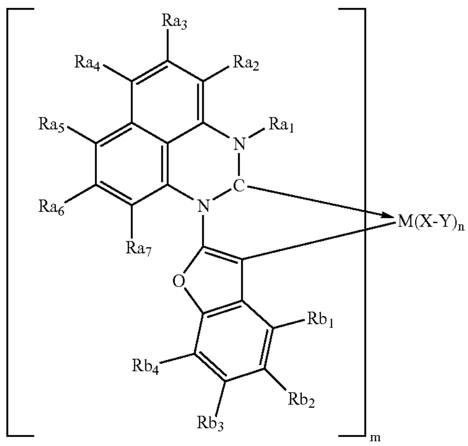
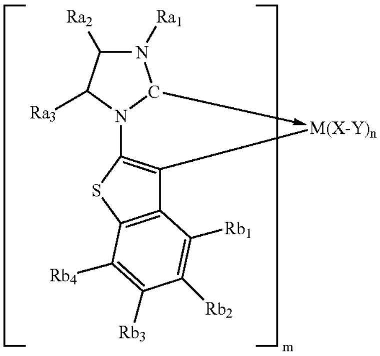


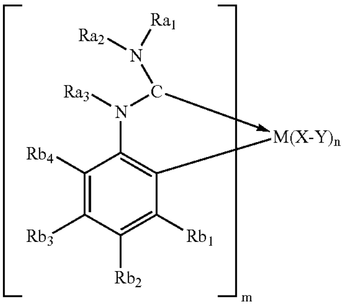
TABLE 41-continued

Preferred compounds

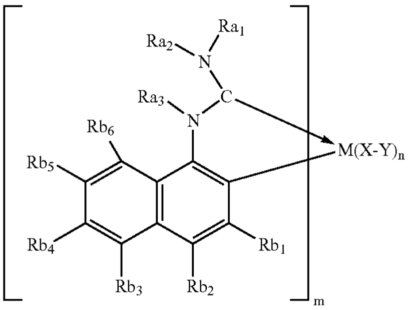
A6
B72



A7
B1



A7
B4



A7
B10

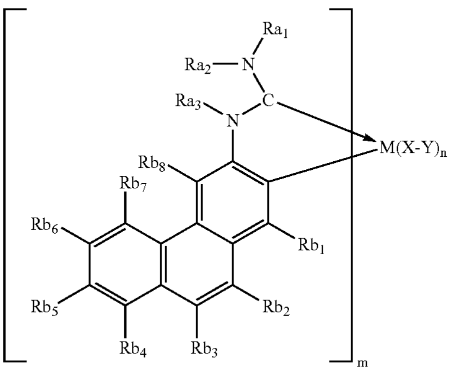
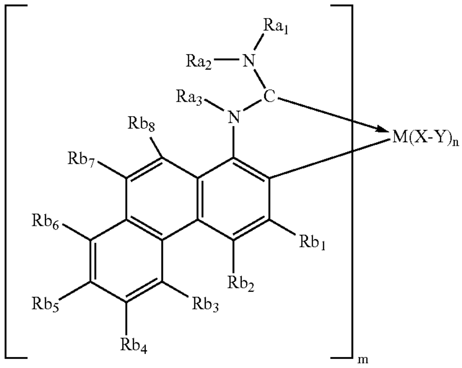


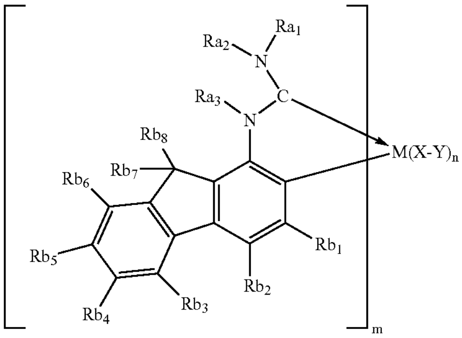
TABLE 41-continued

Preferred compounds

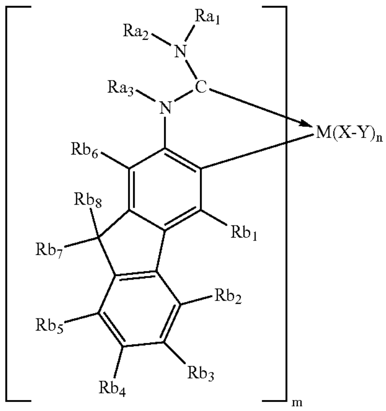
A7
B12



A7
B55



A7
B56



A7
B59

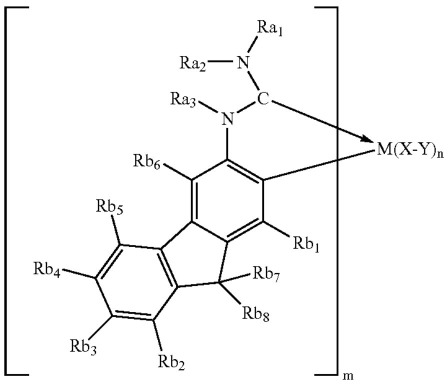
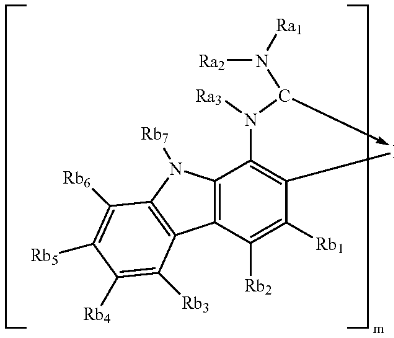


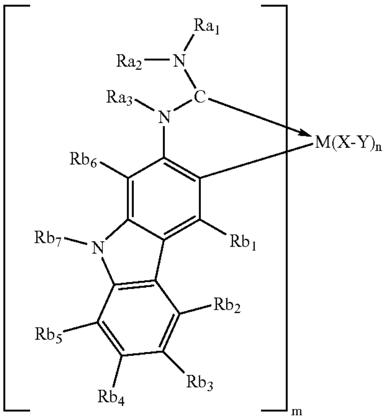
TABLE 41-continued

Preferred compounds

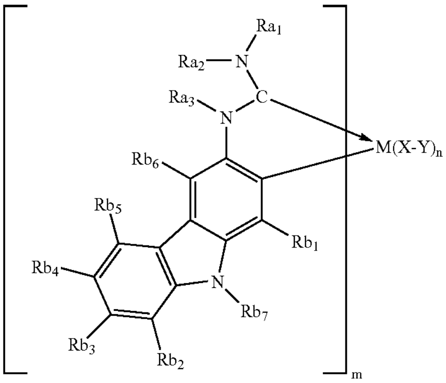
A7
B61



A7
B62



A7
B65



A7
B66

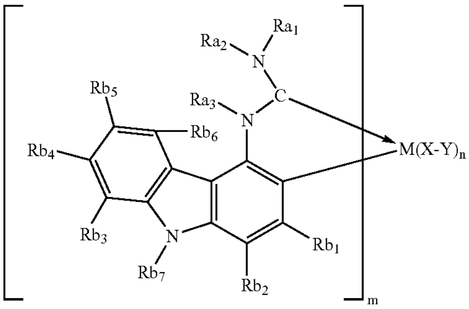
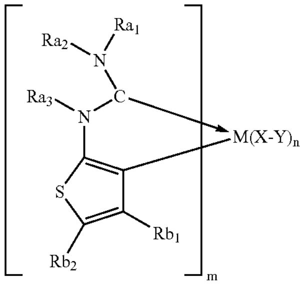


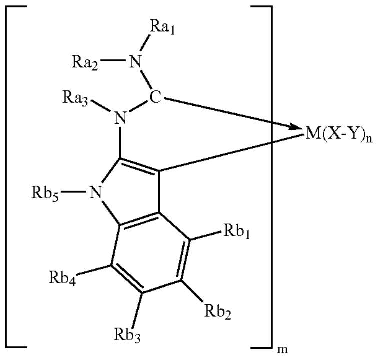
TABLE 41-continued

Preferred compounds

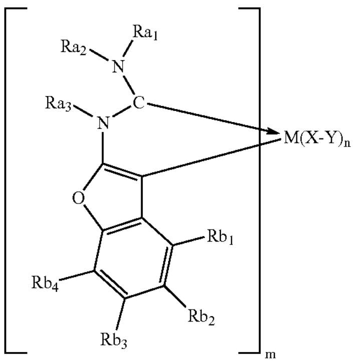
A7
B69



A7
B70



A7
B71



A7
B72

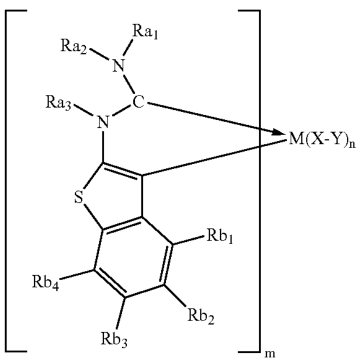


TABLE 41-continued

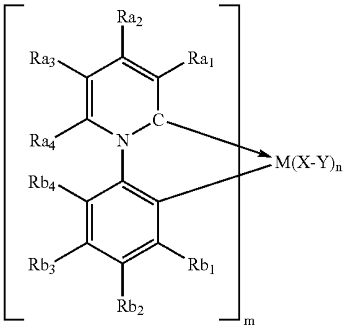
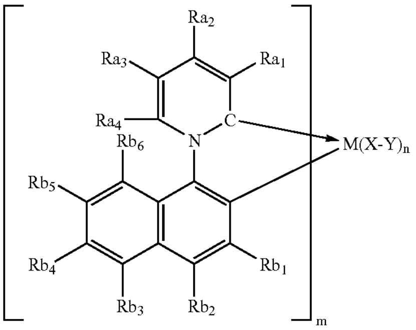
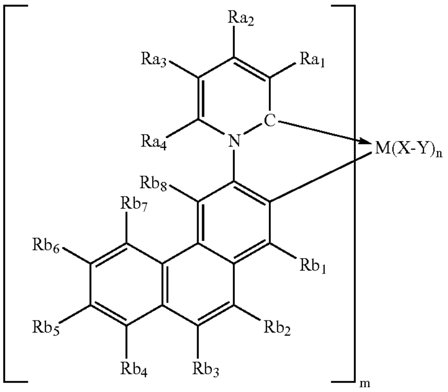
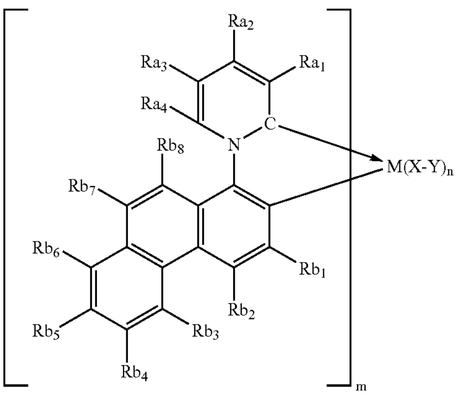
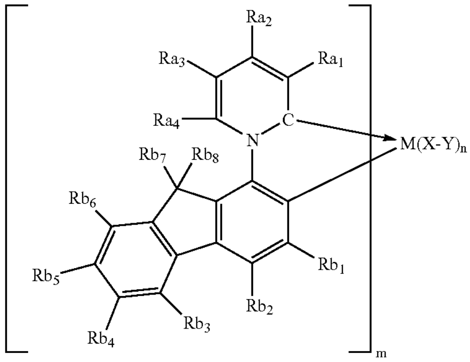
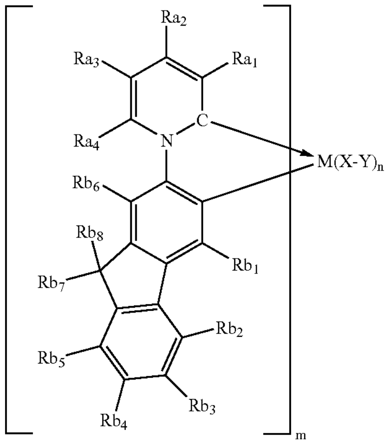
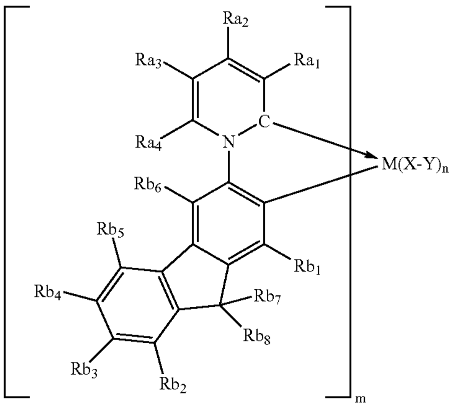
Preferred compounds	
A18 B1	
A18 B4	
A18 B10	
A18 B12	

TABLE 41-continued

Preferred compounds	
A18 B55	
A18 B56	
A18 B59	

^{13}C NMR of mer-Ir(1-Ph-3-Me-imid)$_3$ in $CDCl_3$

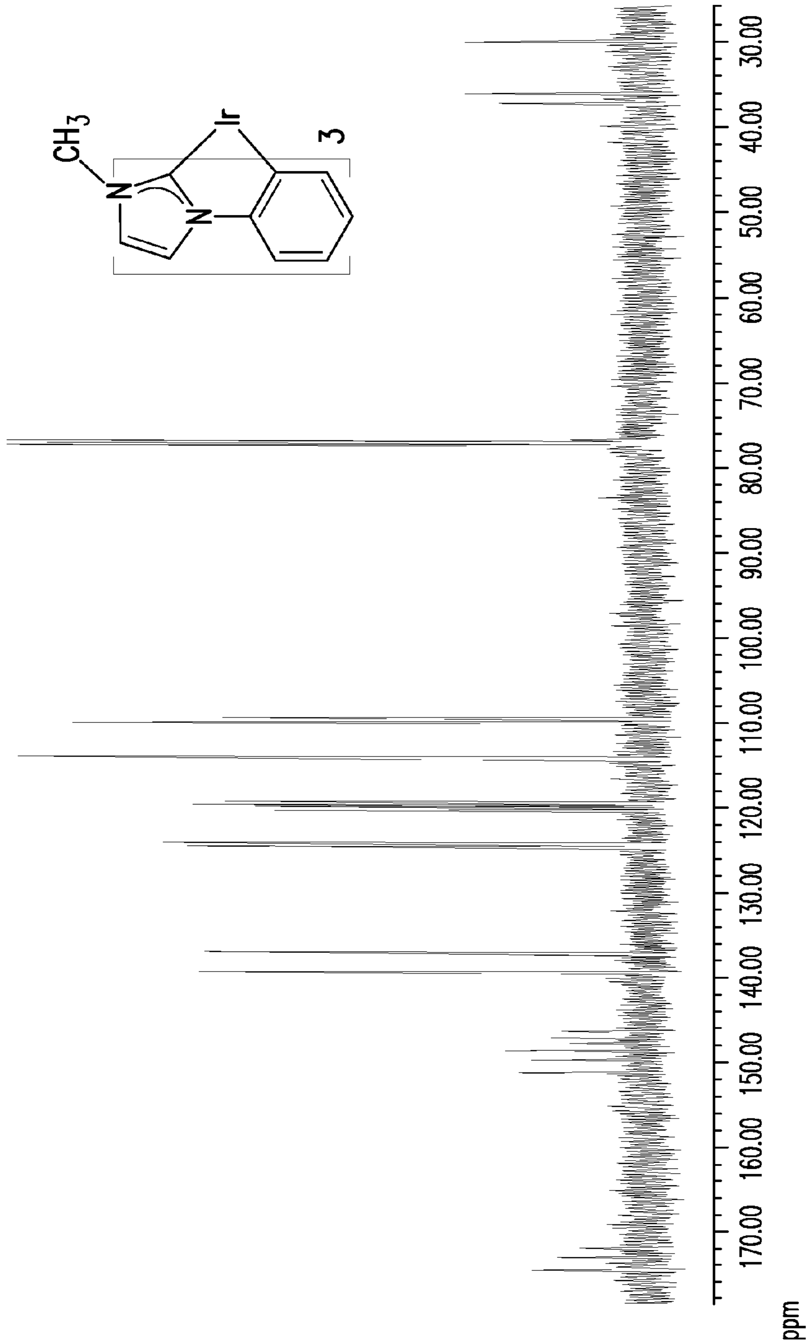
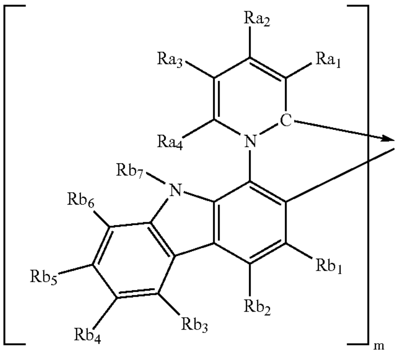


FIG.16

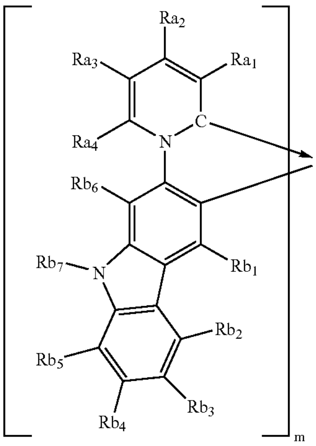
TABLE 41-continued

Preferred compounds

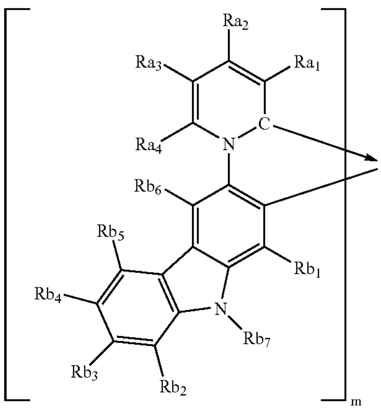
A18
B61



A18
B62



A18
B65



A18
B66

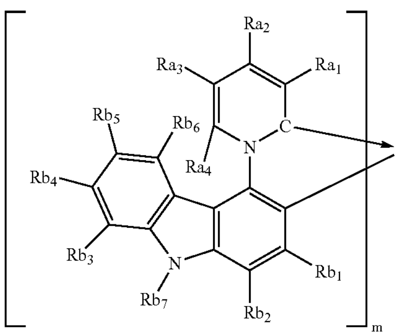
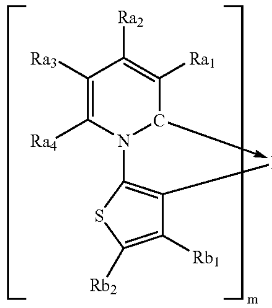


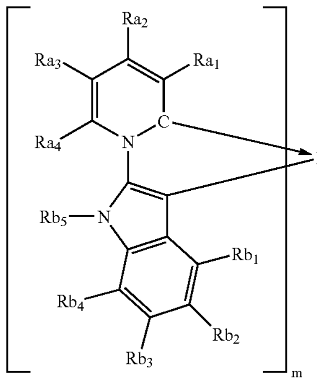
TABLE 41-continued

Preferred compounds

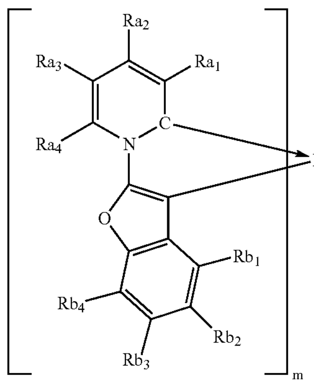
A18
B69



A18
B70



A18
B71



A18
B72

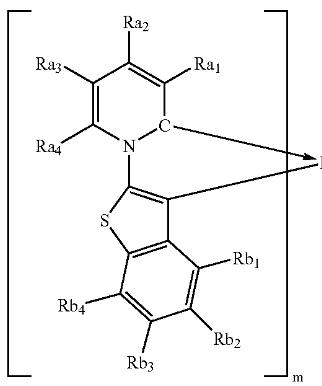


TABLE 41-continued

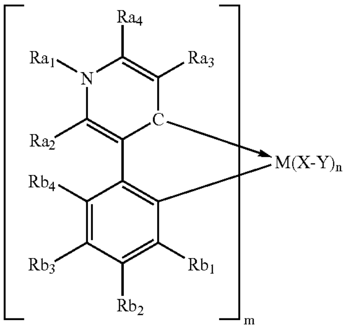
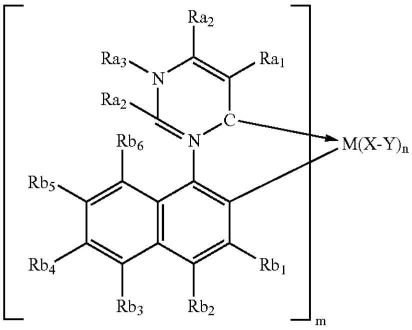
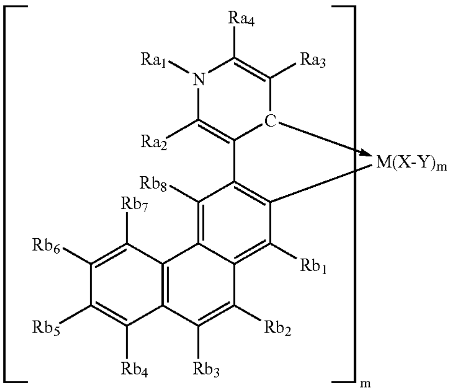
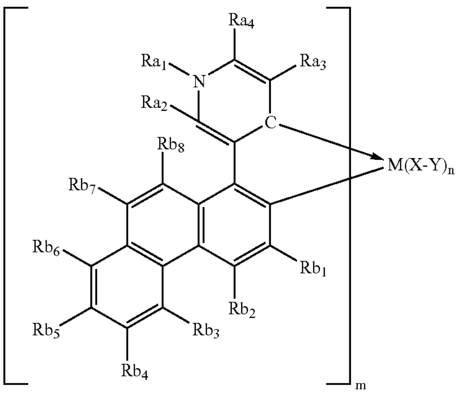
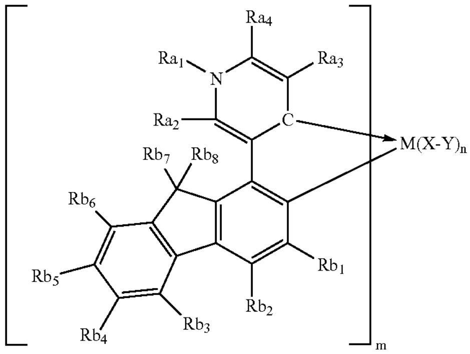
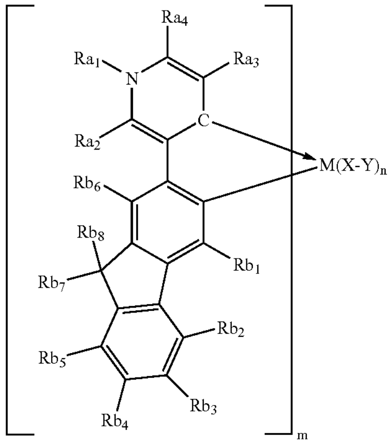
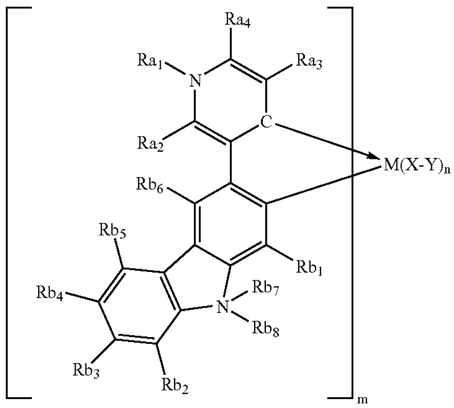
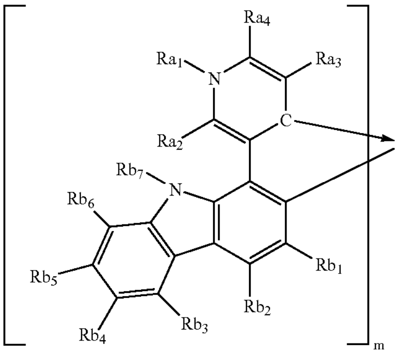
Preferred compounds	
A19 B1	
A19 B4	
A19 B10	
A19 B12	
A19 B55	
A19 B56	
A19 B59	

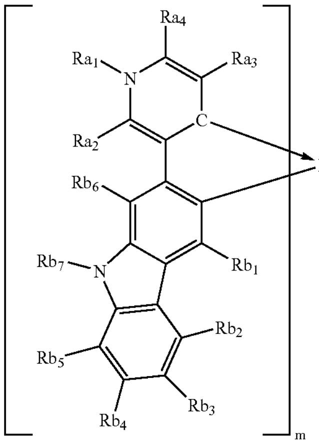
TABLE 41-continued

Preferred compounds

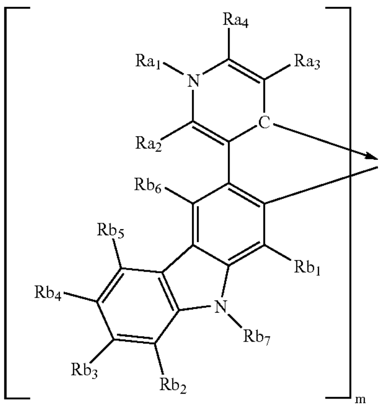
A19 B61



A19 B62



A19 B65



A19 B66

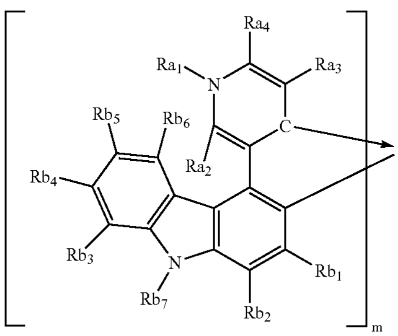
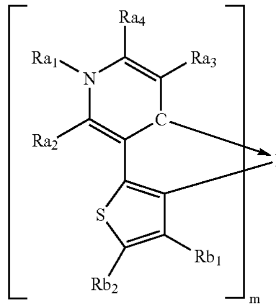


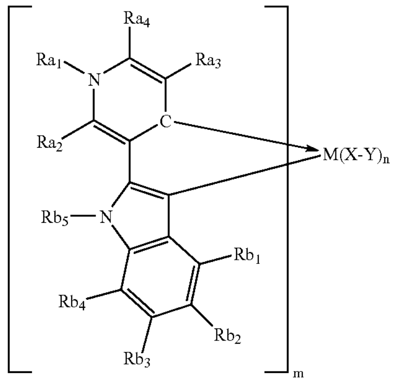
TABLE 41-continued

Preferred compounds

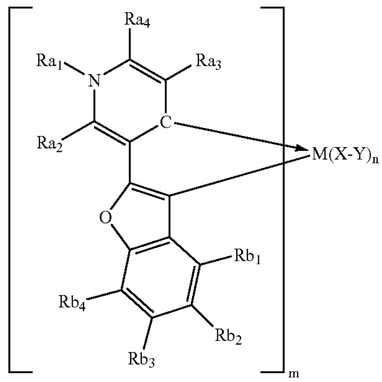
A19 B69



A19 B70



A19 B71



A19 B72

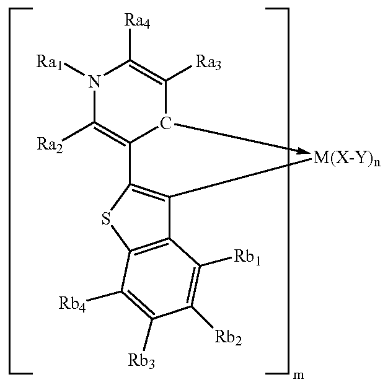
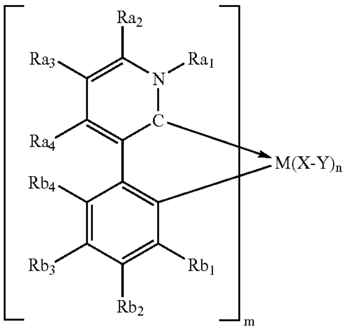


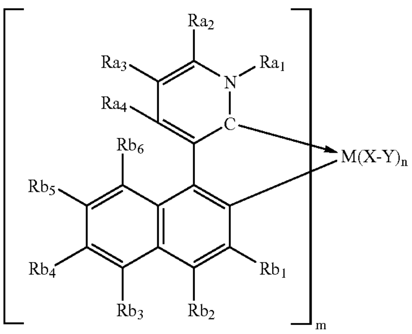
TABLE 41-continued

Preferred compounds

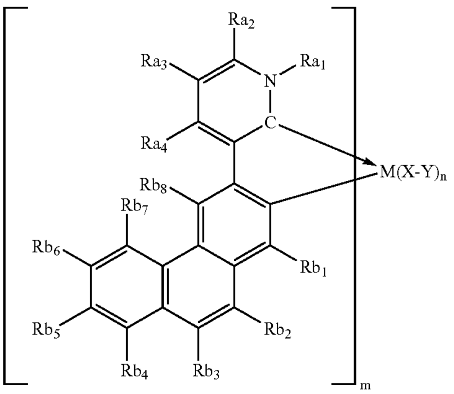
A20
B1



A20
B4



A20
B10



A20
B12

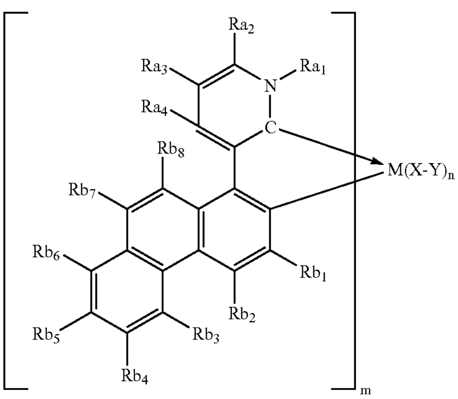
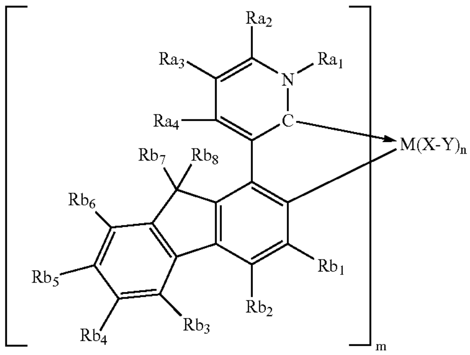


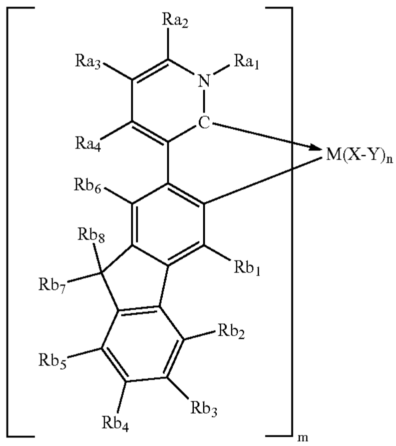
TABLE 41-continued

Preferred compounds

A20
B55



A20
B56



A20
B59

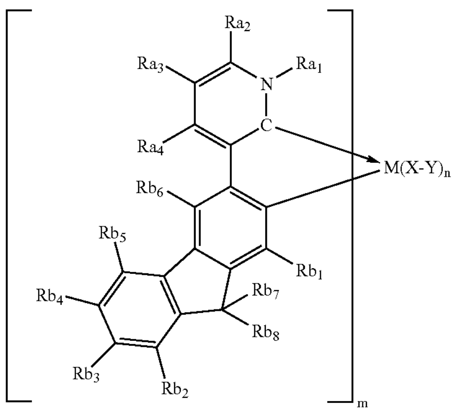


TABLE 41-continued

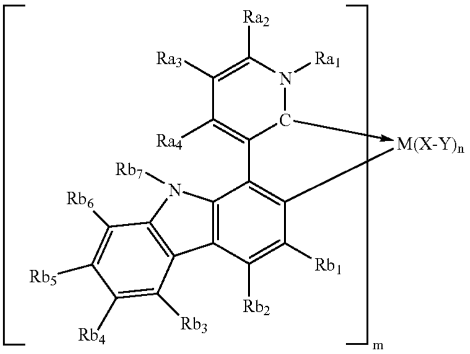
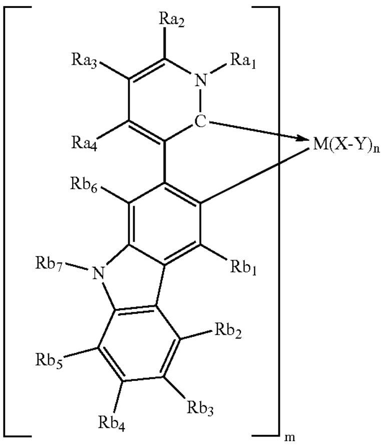
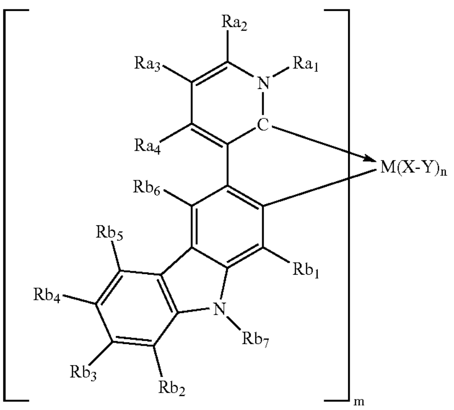
Preferred compounds	
A20 B61	
A20 B62	
A20 B65	

TABLE 41-continued

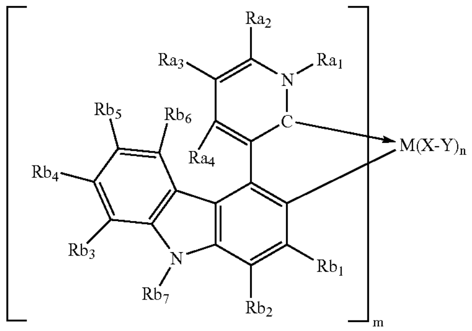
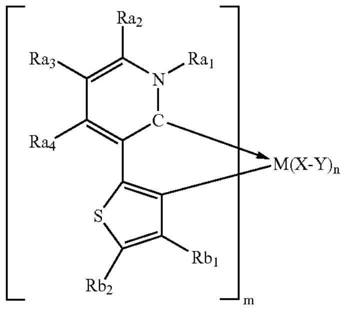
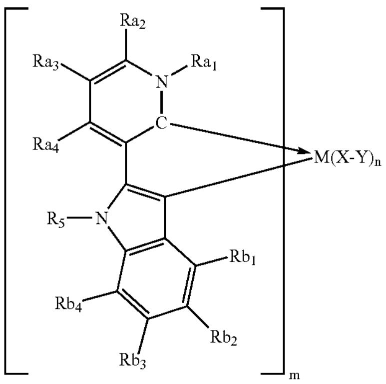
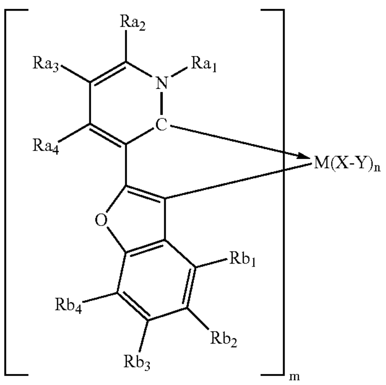
Preferred compounds	
A20 B66	
A20 B69	
A20 B70	
A20 B71	

TABLE 41-continued

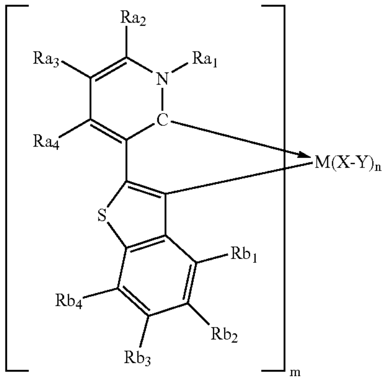
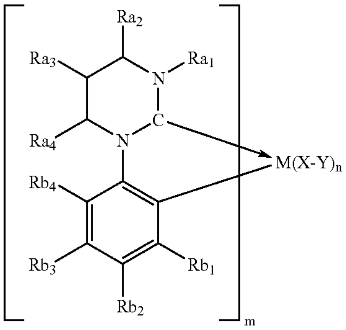
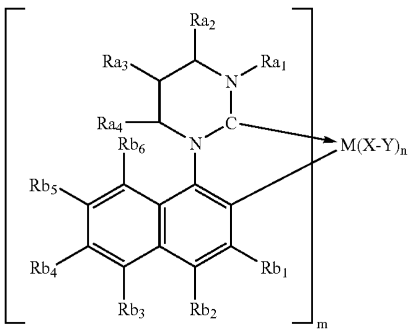
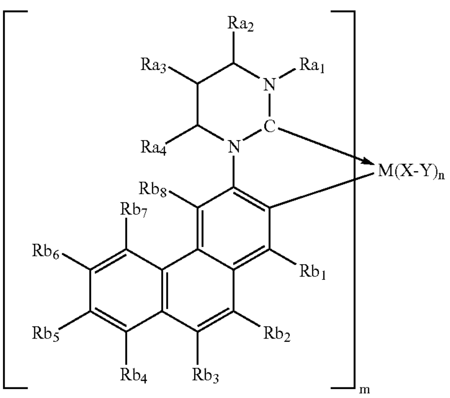
Preferred compounds	
A20 B72	
A33 B1	
A33 B4	
A33 B10	

TABLE 41-continued

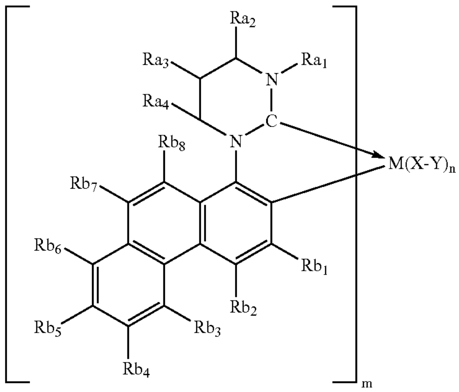
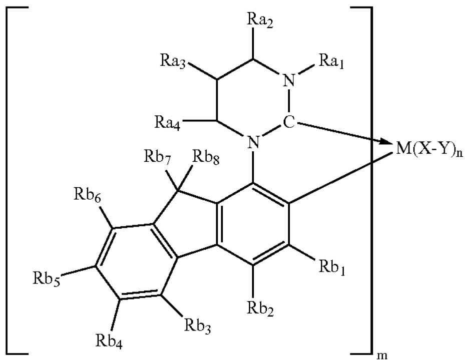
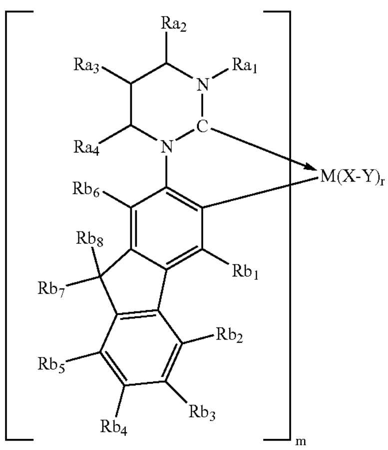
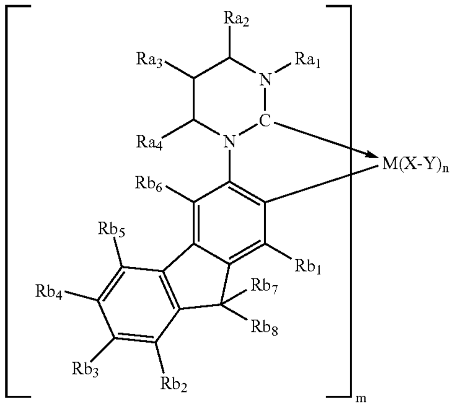
Preferred compounds	
A33 B12	
A33 B55	
A33 B56	

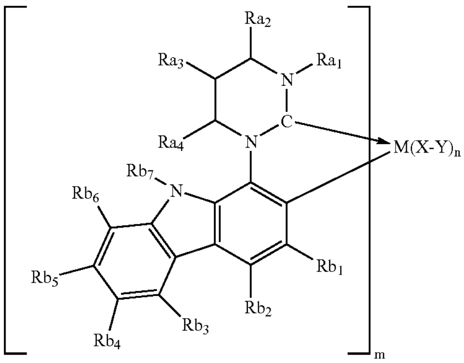
TABLE 41-continued

Preferred compounds

A33
B59



A33
B61



A33
B62

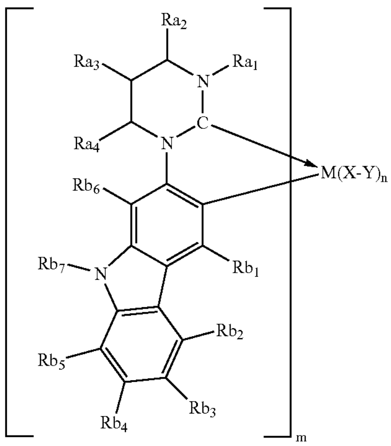
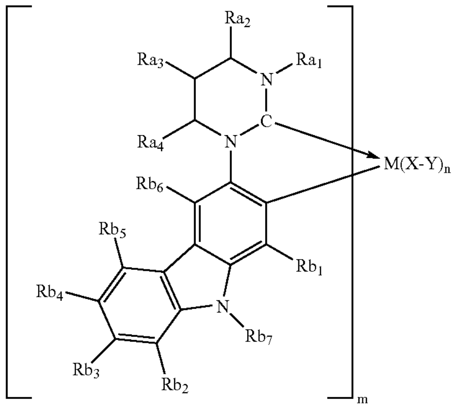


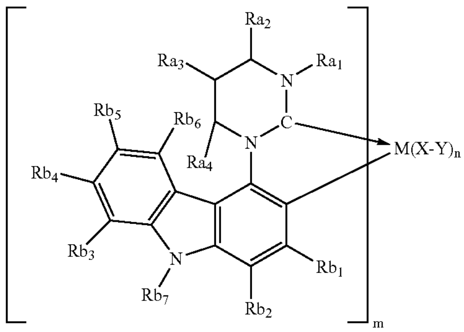
TABLE 41-continued

Preferred compounds

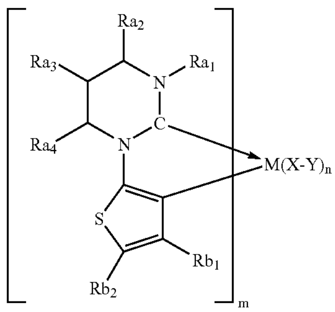
A33
B65



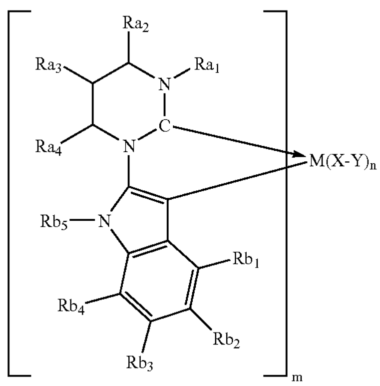
A33
B66



A33
B69

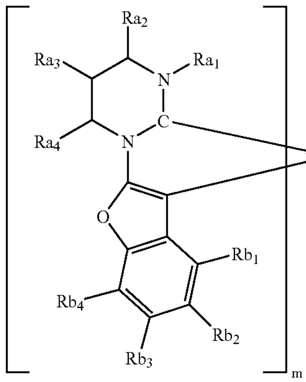


A33
B70

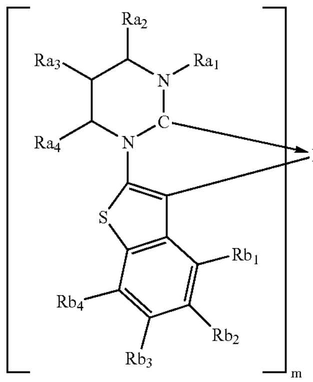


Preferred compounds

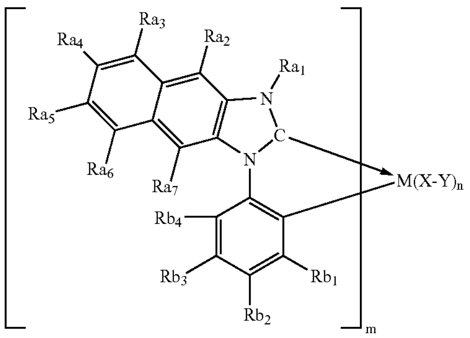
A33
B71



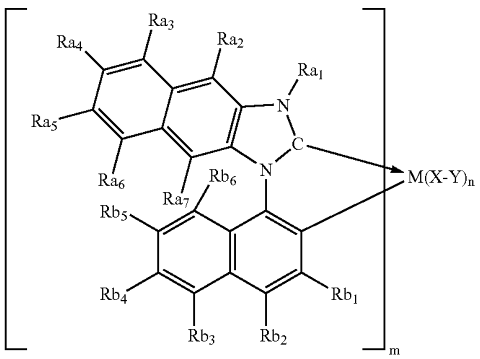
A33
B72



A35
B1

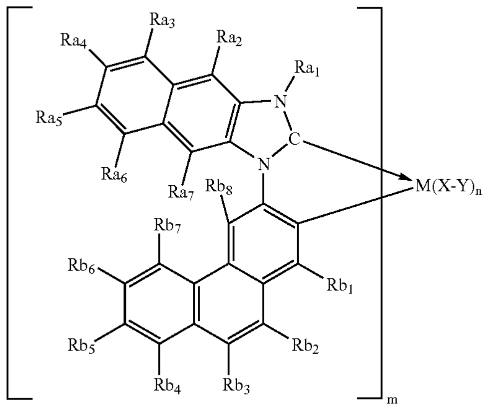


A35
B4

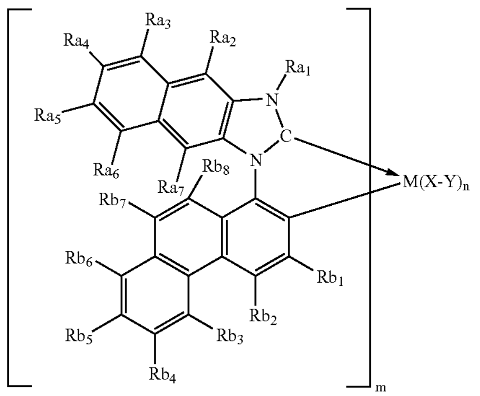


Preferred compounds

A35
B10



A35
B12



A35
B55

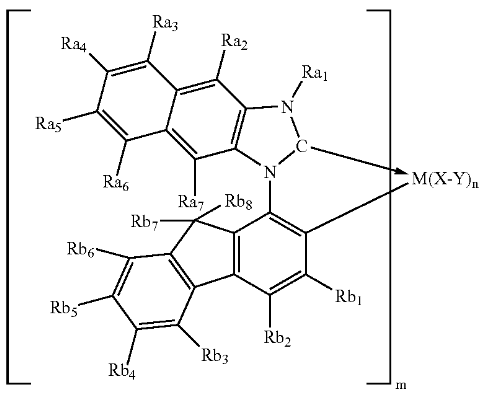


TABLE 41-continued

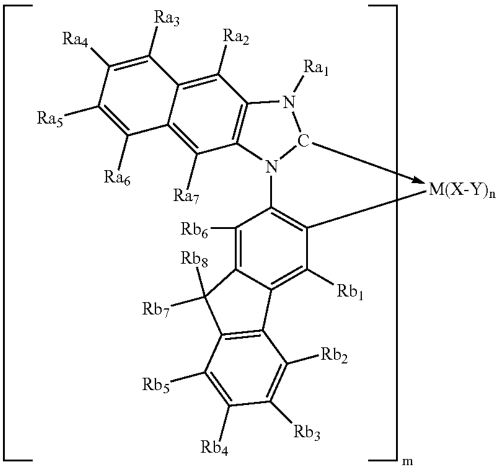
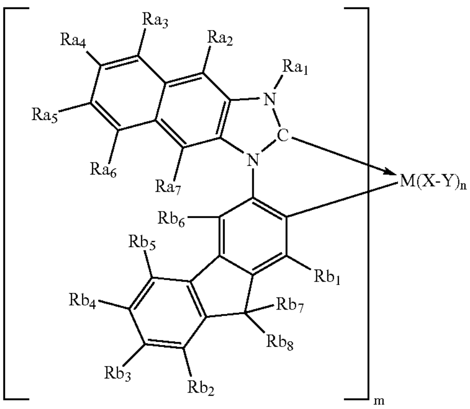
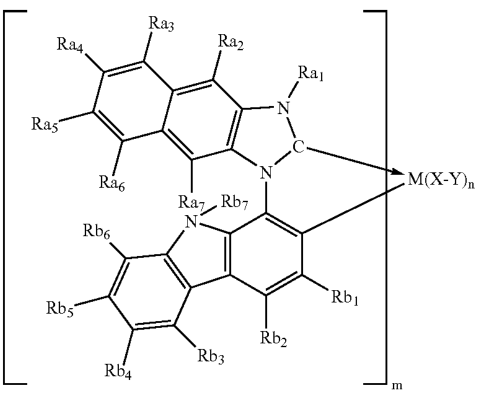
Preferred compounds	
A35 B56	
A35 B59	
A35 B61	

TABLE 41-continued

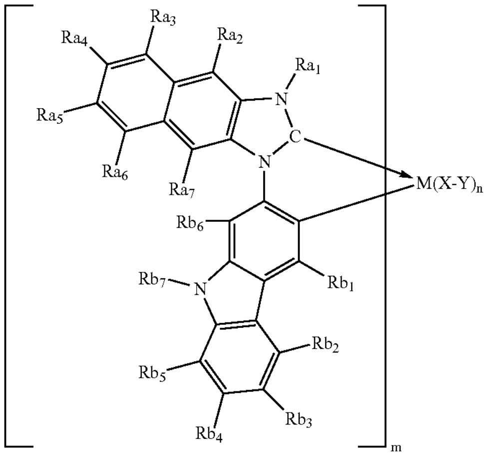
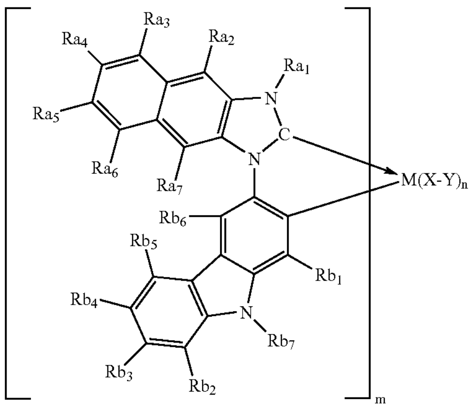
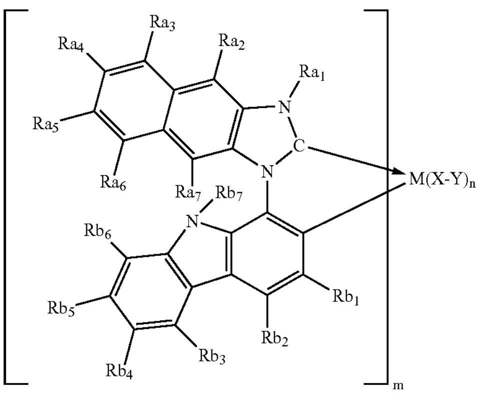
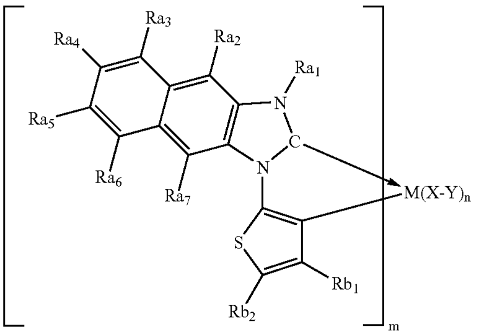
Preferred compounds	
A35 B62	
A35 B65	
A35 B66	

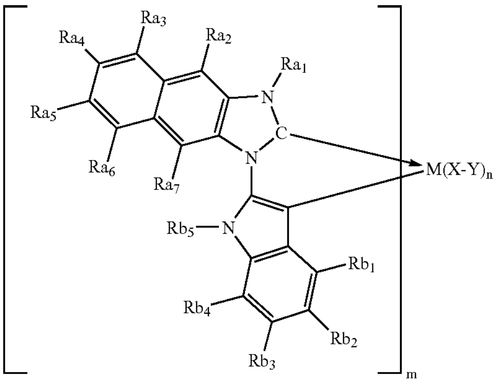
TABLE 41-continued

Preferred compounds

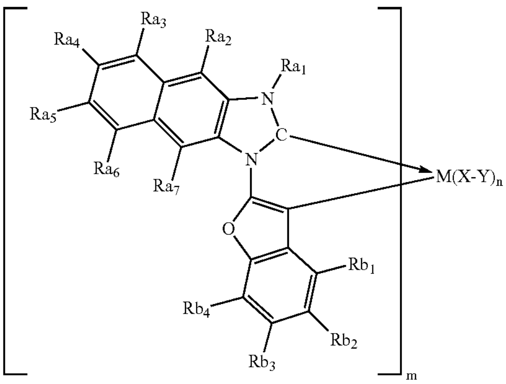
A35
B69



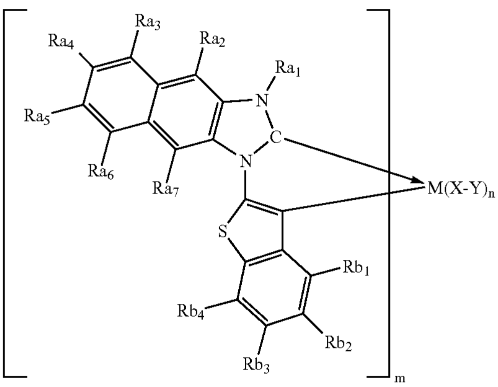
A35
B70



A35
B71



A35
B72



It is understood that the various embodiments described herein are by way of example only, and are not intended to limit the scope of the invention. For example, many of the materials and structures described herein may be substituted with other materials and structures without deviating from the spirit of the invention. It is understood that various theories as to why the invention works are not intended to be limiting. For example, theories relating to charge transfer are not intended to be limiting.

MATERIAL DEFINITIONS

As used herein, abbreviations refer to materials as follows:

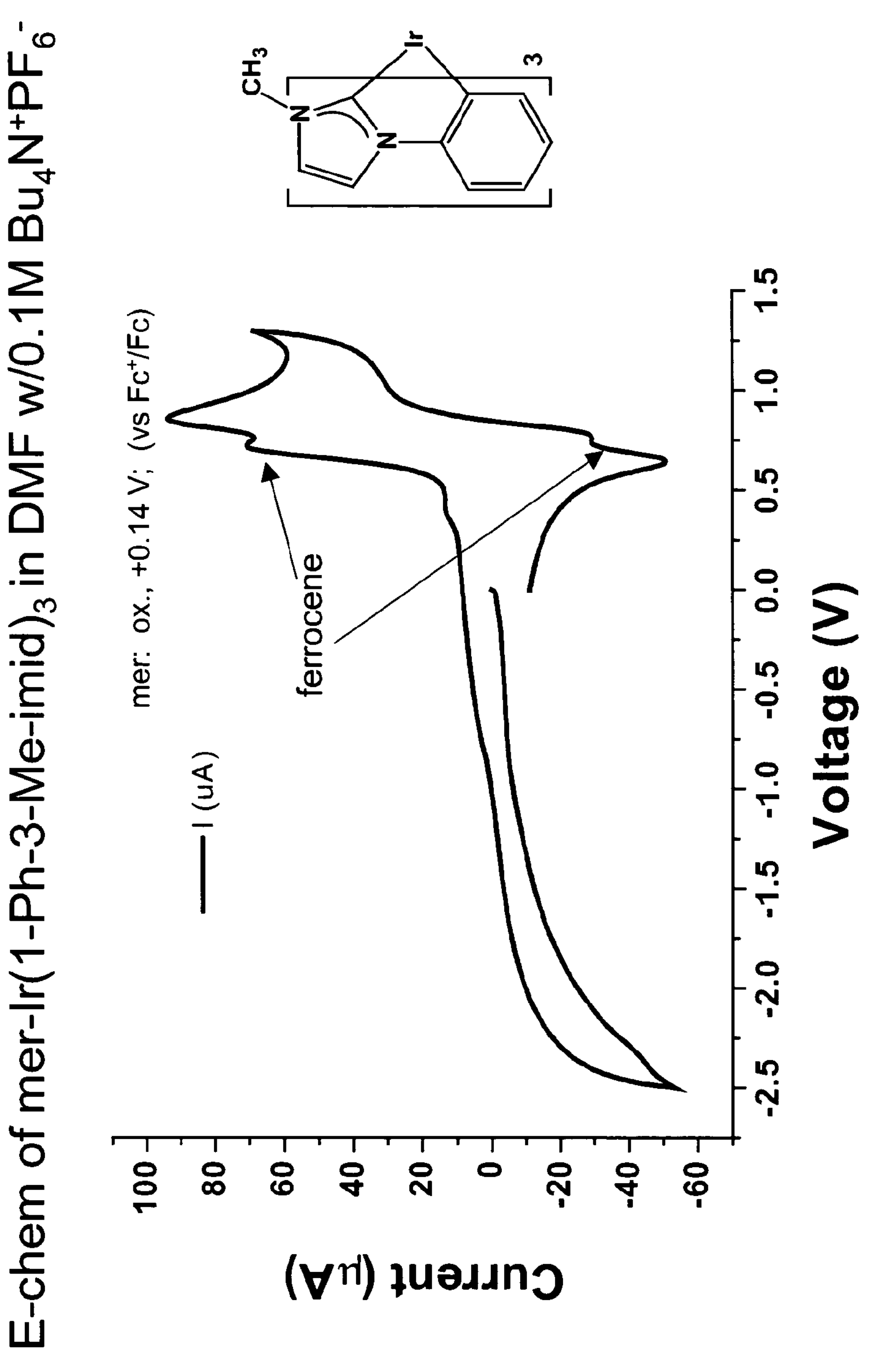
CBP:	4,4'-N,N-dicarbazole-biphenyl
m-MTDATA	4,4',4''-tris(3-methylphenylphenlyamino)triphenylamine
Alq_3:	8-tris-hydroxyquinoline aluminum
Bphen:	4,7-diphenyl-1,10-phenanthroline
n-BPhen:	n-doped BPhen (doped with lithium)
F_4-TCNQ:	tetrafluoro-tetracyano-quinodimethane
p-MTDATA:	p-doped m-MTDATA (doped with F_4-TCNQ)
$Ir(ppy)_3$:	tris(2-phenylpyridine)-iridium
$Ir(ppz)_3$:	tris(1-phenylpyrazoloto,N,C(2')iridium(III)
BCP:	2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline
TAZ:	3-phenyl-4-(1'-naphthyl)-5-phenyl-1,2,4-triazole
CuPc:	copper phthalocyanine.
ITO:	indium tin oxide
NPD:	N,N'-diphenyl-N-N'-di(1-naphthyl)-benzidine
TPD:	N,N'-diphenyl-N-N'-di(3-toly)-benzidine
BAlq:	aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate
mCP:	1,3-N,N-dicarbazole-benzene
DCM:	4-(dicyanoethylene)-6-(4-dimethylaminostyryl-2-methyl)-4H-pyran
DMQA:	N,N'-dimethylquinacridone
PEDOT:PSS:	an aqueous dispersion of poly(3,4-ethylenedioxythiophene) with polystyrenesulfonate (PSS)
UGH	1,3-bis(triphenylsilyl)benzene
1-Ph-3-Me-imid	1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$
1-Ph-3-Me-benzimid	fac-iridium(III) tris(1-phenyl-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$)
mer-$(F_2ppz)_2$Ir(1-Ph-3-Me-imid)	mer-iridium(III) bis[(2-(4',6'-difluorophenyl)-2-pyrazolinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)
mer-$(2-(tpy)_2$Ir(1-Ph-3-Me-imid)	mer-iridium(III) bis[(2-(4'-methylphenyl)-2-pyridinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$
fac-$(2-(tpy)_2$Ir(1-Ph-3-Me-imid)	fac-iridium(III) bis[(2-(4'-methylphenyl)-2-pyridinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)
$[(1\text{-Ph-3-Me-imid})_2IrCl]_2$	Iridium(III) bis(1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$) chloride
(1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$	Iridium(III) bis[(1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)] (4,4'-di-tert-butyl-(2,2')bipyridinyl)
mer-Ir(1-Ph-3-Me-imid)$_3$	mer-iridium(III) tris(1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)
(Ir-Fl-Me-imid)$_3$	tris(1-(2'-(9',9'-dimethyl)fluorenyl)-3-methyl-imidazolin-2-ylidene-C,C3') iridium(III)

EXPERIMENTAL

Specific representative embodiments of the invention will now be described, including how such embodiments may be made. It is understood that the specific methods, materials, conditions, process parameters, apparatus and the like do not necessarily limit the scope of the invention.

Synthesis of Imidazolate Carbene Precursors

1-Phenylimidazole was purchased from Aldrich. All other aryl imidazoles were prepared by a modified Ullmann coupling reaction between imidazole or benzimidazole and the appropriate aryl iodide in anhydrous N,N-dimethylforma-



E-chem of mer-Ir(1-Ph-3-Me-imid)$_3$ in DMF w/0.1M $Bu_4N^+PF_6^-$
mer: ox., +0.14 V; (vs Fc^+/Fc)
I (uA)
ferrocene
CH_3
N
N
Ir
3
Current (μA)
Voltage (V)
100
80
60
40
20
0
-20
-40
-60
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5

Figure 17

mide using a CuI/1,10-phenanthroline catalyst and Cs_2CO_3 base, as described in Klapars, et al, *J. Am. Chem. Soc.*, 2001, 123; 7727-7729. The carbene precursor imidazolates were prepared by methylating the corresponding imidazoles with excess methyl iodide in toluene.

Example 1

Synthesis of 1-phenyl-3-methylimidazolate iodide

1-phenyl-3-methylimidazolate iodide was synthesized using the modified Ullmann coupling reaction described above. ^{1}H NMR (250 MHz, $CDCl_3$), ppm: 10.28 (s, 1H), 7.77-7.70 (m, 4H), 7.56-7.46 (m, 3H), 4.21 (s, 3H).

Example 2

Synthesis of 1-Phenyl-3-methyl-benzimidazolate iodide

In the dark, an oven-dried 50 ml round-bottomed flask containing a stir bar was charged with CuI (0.171 g, 0.1 eq.), benzimidazole (1.273 g, 1.2 eq.), and cesium carbonate (6.138 g, 2.1 eq.) respectively. The round-bottomed flask with the contents was sealed with septa and degassed with argon for 15 minutes. Iodobenzene (1 ml, 1 eq.), 1,10-Phenanthroline (0.323 g, 0.2 eq.), and dimethylformamide (25 ml) were then successively added into the round-bottomed flask under a continuous flow of argon. The reaction mixture was degassed with argon for 30 minutes. The reaction was stirred with heating via an oil bath at 110° C. for 24 hours in the dark under nitrogen. The reaction mixture was cooled to ambient temperature and concentrated in vacuo. 10 ml of ethyl acetate was added into the concentrated reaction mixture. It was then filtered and washed with 30 ml of ethyl acetate. The filtrate was concentrated under vacuo to give the crude product. The crude product was purified by column chromatography on silica gel (40% ethyl acetate:60% hexane as the eluent) providing 0.780 g of 1-Phenyl benzoimidazole (45% yield) as yellow liquid.

Methyl iodide (0.550 ml, 2.2 eq.) was syringed into a 25 ml round-bottomed flask charged with 1-phenyl benzoimidazole (0.780 g, 1 eq.) and toluene (15 ml). The reaction was stirred and heated at 30° C. for 24 hours. The white precipitate was filtered and washed with 20 ml of toluene. The white precipitate was air-dried and weighed to give 0.725 g of 1-phenyl-3-methyl-benzimidizolate iodide (54% yield).

Synthesis of Iridium Imidazole Carbene Complexes

Example 3

Synthesis of mer-iridium(III) bis[(2-(4',6'-difluorophenyl)-2-pyrazolinato-N,$C^{2'}$)](1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)

A 25 ml round-bottomed flask was charged with 0.014 g of silver(I) oxide, 0.030 g of 1-phenyl-3-methyl-imidazolate iodide, 0.062 g of $[(F2ppz)_2IrCl]_2$, and 15 ml of 1,2-dichloroethane. The reaction was stirred and heated with an oil bath at 77° C. for 15 hours in the dark under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Filtration through Celite using dichloromethane as the eluent was performed to remove the silver(I) salts. A light yellow solution was obtained and addition of methanol gave 0.025 g (30% yield) of iridium complex as a colorless solid.

^{1}H NMR (500 MHz, $CDCl_3$), ppm: 8.24 (d, 1H, J=2.8 Hz), 8.16 (d, 1H, J=2.8 Hz), 7.43 (d, 1H, J=1.9 Hz), 7.15 (d, 1H, J=7.5 Hz), 6.96 (ddd, 1H, J=7.5, 7.0, 1.9 Hz), 6.93 (dd, 1H, J=7.0, 1.9 Hz), 6.82 (m, 2H), 6.78 (d, 1H, J=1.9 Hz), 6.47 (ddd, 1H, J=11.7, 8.4, 2.3 Hz), 6.43 (ddd, 1H, J=11.7, 8.4, 2.3 Hz), 6.29 (t, 1H, J=2.3 Hz), 6.28 (t, 1H, J=2.3 Hz), 6.14 (dd, 1H, J=7.5, 2.3 Hz), 5.85 (dd, 1H, J=8.0, 2.3 Hz), 3.29 (s, 3H).

FIG. **3** shows the ^{1}H NMR spectra of mer-$(F_2ppz)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$.

Example 4

Synthesis of mer-iridium(III) bis[(2-(4'-methylphenyl)-2-pyridinato-N,$C^{2'}$)](1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)

A 50 ml round-bottomed flask was charged with 0.103 g of silver(I) oxide, 0.118 g of 1-phenyl-3-methyl-imidazolate iodide, 0.168 g of $[(tpy)_2IrCl]_2$, and 25 ml of 1,2-dichloroethane. The reaction was stirred and heated with an oil bath at 77° C. for 15 hours in the dark under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Filtration through Celite using dichloromethane as the eluent was performed to remove the silver(I) salts. A yellow solution was obtained and further purified by flash column chromatography on silica gel using dichloromethane as the eluent that was reduced in volume to ca. 2 ml. Addition of methanol gave 0.121 g (59% yield) of iridium complex as a bright yellow solid.

FIG. **4** shows the ^{1}H NMR spectra of mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$. FIG. **6** shows the plot of current (μA) vs. voltage (V) of a mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) compound with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF_6^-$ is used. FIG. **9** shows the emission spectra of mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF at room temperature and at 77K. The compound exhibits lifetimes of 1.7 Us at room temperature and 3.3 μs at 77K.

Example 5

Synthesis of fac-iridium(III) bis[(2-(4'-methylphenyl)-2-pyridinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$)

A 200 ml quartz flask was charged with 0.0.059 g of mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) and 50 ml of acetonitrile and sparged with nitrogen for five minutes. The mixture was photolyzed for 63 hours using 254 nm light. After photolysis the solvent was removed under reduced pressure and the yellow solid was taken up in 2 ml dichloromethane. Addition of methanol gave 0.045 g (75% yield) of iridium complex as a bright yellow solid that was collected by centrifuge.

FIG. **5** shows the ^{1}H NMR spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$. FIG. **7** shows the plot of current (μA) vs. voltage (V) of a fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) compound with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF6^-$ is used. FIG. **8** shows the absorption spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) and mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in CH_2Cl_2. FIG. **10** shows the emission spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF at room temperature and at 77K. The compound exhibits lifetimes of 1.7 μs at room temperature and 3.3 μs at 77K.

Example 6

Synthesis of Iridium(III) bis(1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) chloride dimer

A 100 ml round-bottomed flask was charged with 0.428 g of silver(I) oxide, 0.946 g of 1-phenyl-3-methyl-imidazolate iodide, 0.301 g of iridium trichloride hydrate, and 60 ml of 2-ethoxyethanol. The reaction was stirred and heated with an oil bath at 120° C. for 15 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and the solvent was removed under reduced pressure. The black mixture was extracted with ca. 20 ml dichloromethane and the extract was reduced to ca. 2 ml volume. Addition of methanol gave 0.0160 g (30% yield) of the iridium dimer complex as an off-white solid.

FIG. **11** shows the ^{1}H NMR spectra of [(1-Ph-3-Me-imid)$_2$ IrCl]$_2$ in $CDCl_3$.

Example 7

Synthesis of mer-iridium(III) tris(1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$)

A 50 ml round-bottomed flask was charged with 0.076 g of silver(I) oxide, 0.109 g of 1-phenyl-3-methyl-imidazolate iodide, 0.029 g of iridium trichloride hydrate, and 20 ml of 2-ethoxyethanol. The reaction was stirred and heated with an oil bath at 120° C. for 15 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Filtration through Celite using dichloromethane as the eluent was performed to remove the silver(I) salts. A white solid was obtained after removing the solvent in vacuo and was washed with methanol to give 0.016 g (24% yield) of meridional tris-iridium complex as a white solid.

FIG. **15** shows the ^{1}H NMR spectra of mer-Ir(1-Ph-3-Me-imid)$_3$ in $CDCl_3$. FIG. **16** shows the ^{13}C NMR spectra of mer-Ir(1-Ph-3-Me-imid)$_3$ in $CDCl_3$. FIG. **17** shows the plot of current (μA) vs. voltage (V) of a mer-Ir(1-Ph-3-Me-imid)$_3$ compound with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF_6^-$ is used. FIG. **18** shows the emission spectra of mer-Ir(1-Ph-3-Me-imid)$_3$ in 2-MeTHF at room temperature and at 77K.

Example 8

Synthesis of fac-iridium(III) tris(1-phenyl-3-methyl-imidazolin-2-ylidene-C,C2')

A 50 ml round-bottomed flask was charged with 0.278 g of silver(I) oxide, 0.080 g of 1-phenyl-3-methyl-imidazolate iodide, 0.108 g of [(1-Ph-3-Me-imid)2IrCl]2, and 25 ml of 1,2-dichloroethane. The reaction was stirred and heated with an oil bath at 77° C. for 15 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Filtration through Celite using dichloromethane as the eluent was performed to remove the silver(I) salts. A light brown solution was obtained and further purified by flash column chromatography on silica gel using dichloromethane as the eluent and was then reduced in volume to ca. 2 ml. Addition of methanol gave 0.010 g (8% yield) of iridium complex as a colorless solid.

FIG. **19** shows the ^{1}H NMR spectra of fac-Ir(1-Ph-3-Me-imid)$_3$ in $CDCl_3$. FIG. **20** shows the absorption spectra of fac-Ir(1-Ph-3-Me-imid)$_3$ in CH_2Cl_2. FIG. **21** shows the emission spectra of fac-Ir(1-Ph-3-Me-imid)$_3$ in 2-MeTHF at room temperature and at 77K. The compound exhibits lifetimes of 0.50 μs at room temperature and 6.8 μs at 77K.

Example 9

Synthesis of fac-iridium(III) tris(1-phenyl-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$)

A 25 ml round-bottomed flask was charged with 0.165 g of silver(I) oxide, 0.200 g of 1-phenyl-3-methyl-benzimidazolate iodide, 0.0592 g of iridium trichloride hydrate, and 15 ml of 2-ethoxyethanol. The reaction was stirred and heated with an oil bath at 120° C. for 24 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Flash column chromatography on Celite using dichloromethane as the eluent was performed to remove the silver(I) salts. A brown oil was obtained and further purified by flash column chromatography on silica gel using dichloromethane as the eluent to give 0.050 g of facial tris-iridium complex (33% yield) as an off-white solid.

FIG. **22** shows the ^{1}H NMR spectra of 1-Ph-3-Me-benzimid in $CDCl_3$. FIG. **23** shows the ^{1}H NMR spectra of fac-Ir (1-Ph-3-Me-benzimid)$_3$ in $CDCl_3$. FIG. **24** shows the plot of current (mA) vs. voltage (V) of a fac-Ir(1-Ph-3-Me-benzimid)$_3$ compound with ferrocene as an internal reference. A solvent of anhydrous DMF is used. FIG. **25** shows the emission spectra of fac-Ir(1-Ph-3-Me-benzimid)$_3$ in 2-MeTHF at room temperature and at 77K. The compound emits a spectrum at CIE 0.17, 0.04. The lifetime measurements of an Ir(1-Ph-3-Me-benzimid)$_3$ compound is shown on Table A.

TABLE A

Temperature	Peak wavelength	Lifetime, τ
Room temperature	402 nm	0.32 μs
Room temperature	420 nm	0.29 μs
77 K	400 nm	2.6 μs
77 K	420 nm	2.7 μs

Example 10

Synthesis of iridium(III) bis(1-phenyl-3-methyl-imidazolin-2-ylidene-C,C2') (4,4'-di-tert-butylbipyidyl) hexafluorophosphate

A 25 ml round-bottomed flask was charged with 0.010 g of [(1-Ph-3-Me-imid)2IrCl]2, 0.005 g of 4'4'-di-tert-butyl-bipyridine and 15 ml of dichloromethane. The reaction was stirred at room temperature for 16 hours. The solvent was removed under reduced pressure and the resultant yellow solid was dissolved in ca. 2 ml methanol. Addition of an aqueous ammonium hexafluorophosphate solution produced a yellow precipitate. The precipitate was collected by filtration, washed with water and dried. Chromatography on silica addition of hexanes gave 0.015 g (82% yield) of iridium complex as an orange solid.

FIG. **12** shows the ^{1}H NMR spectra of (1-Ph-3-Me-imid)$_2$ Ir(t-Bu-bpy)$^+$ in $CDCl_3$. FIG. **13** shows the absorption spectra of (1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$ in CH_2Cl_2. FIG. **14** shows the emission spectra of (1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$ in 2-MeTHF at 77K and (1-Ph-3-Me-imid)$_2$Ir(t-Bu-bpy)$^+$ in CH_2Cl_2 at room temperature. The compound exhibits lifetimes of 0.70 μs at room temperature and 6.0 μs at 77K.

Example 11

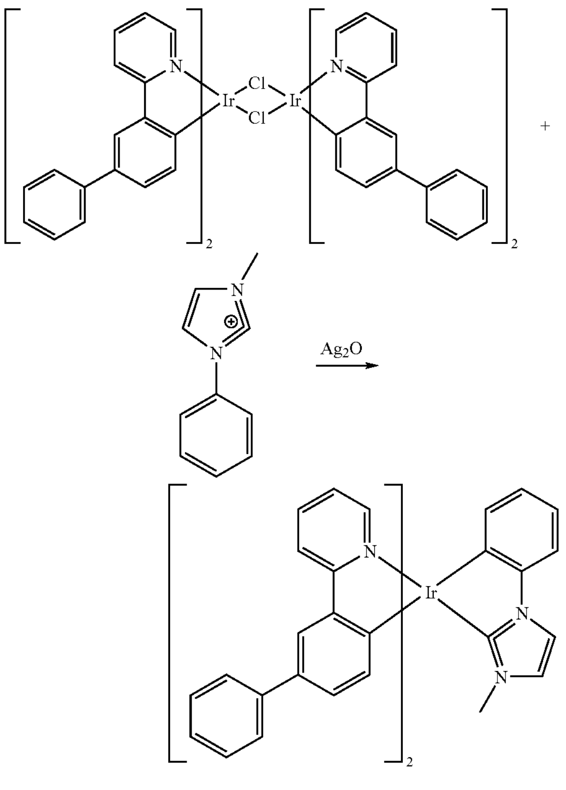
Synthesis of mer-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$)

Step 1: Synthesis of 1-phenyl-3-methylimidozolate iodide

About 13 g of 1-phenylimidazole and 13 g of methyl iodide were added to 100 ml of toluene and heated to a gentle reflux. After 4 hours, the solvent was removed and the product was precipitated from dichloromethane with diethyl ether. The white solid product was collected by vacuum filtration yielding about 20 g of 1-phenyl-3-methylimidozolate iodide.

Step 2:

To a 500 ml round bottom flasks 4.2 grams of 1-phenyl-3-methylimidozolate iodide, 5 g of [IrCl{2-(5-biphenyl)-pyridine}$_2$]$_2$, made by methods described in Thompson, M. E., *J. Am. Chem. Soc.,* 2001, 123, 4304-4312, 3.4 grams of silver oxide, and 200 ml of 1,2-dicholorethane were added. This mixture was heated to reflux for 5 hours under a nitrogen atmosphere. The reaction was allowed to cool and was then filtered through silica gel using dichloromethane as the eluent. The good fractions were combined, the solvent was removed, and the product was crystallized from a dichloromethane/hexane mixture to yield mer-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) as a yellow solid.



Example 12

Synthesis of fac-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$)

Step 1:

Mer-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) was synthesized as described in Example 10 above.

Step 2:

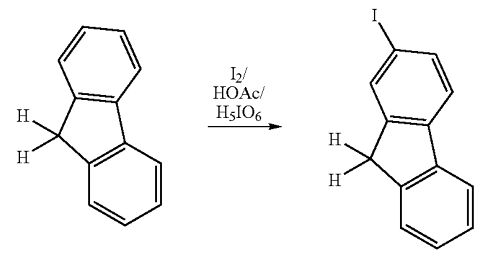
2 g of mer-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) solid was dissolved in acetonitrile, placed in a quartz reaction flask, and exposed to ultraviolet radiation in a Rayonet Photochemical Reactor for 18 hours. Most of the solvent was removed by rotoevaporation and the solids were filtered. The product was recrystallized form dichloromethane/methanol. Approximately 1.2 g of solids were collected by vacuum filtration. The obtained fac-iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) was further purified by sublimation.

Example 13

Synthesis of mer-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$ and fac-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$

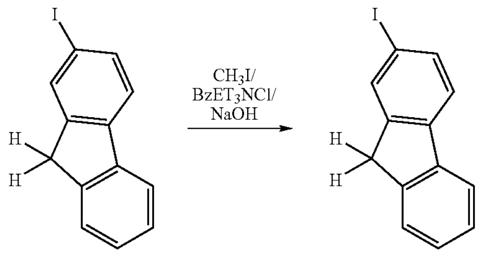
Step 1: Synthesis of 2-Iodofluorene

A 250 mL round-bottomed flask was charged with 20.0 g (120 mmol) fluorene, 16.0 g (60 mmol) iodine and 4.0 g (17 mmol) periodic acid. 150 mL (80%) acetic acid was added to the reaction mixture. The mixture was stirred under nitrogen at 80° C. for 4 hours. The mixture was then allowed to cool to ambient temperature. The solid residue was vacuum filtered, dissolved in toluene and then washed with 5% sodium hydrogen sulphite (to remove excess iodine). The toluene solution was concentrated under vacuo and then passed through a flash column using toluene as the eluent to give 32.0 g (91% yield) of the product (off white solid).



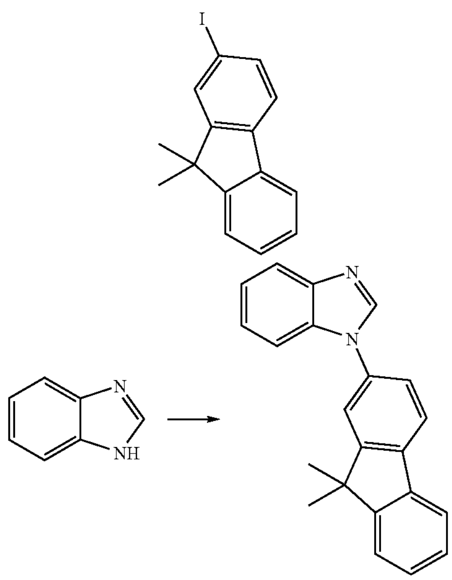
Step 2: Synthesis of 2-iodo-9,9-dimethyl-fluorene

A 500 mL round bottomed flask was charged with 21.8 g (70 mmol) 2-Iodofluorene and 1.18 g (5 mmol) benzyltriethylammonium chloride. 200 mL of dimethylsulfoxide (DMSO) was then added followed by 28 mL (50%) NaOH. The mixture was allowed to stir under nitrogen for 1 hour, before 29 g (210 mmol) methyl iodide was added through the septum. The mixture was allowed to stir at room temperature for 18 hours. After cooling to ambient temperature the mixture was transferred to a 1 L separatory funnel. 100 mL of water and 100 mL of diethylether were added to the mixture. The organic layer was collected and the aqueous layer was extracted with diethyl ether (4×100 mL). The organic fractions were combined, dried over anhydrous magnesium sulfate, and the solvent evaporated under vacuo. A flash column was then performed using hexanes as the eluent to give 21.0 g (88% yield) of the product (yellow oil).



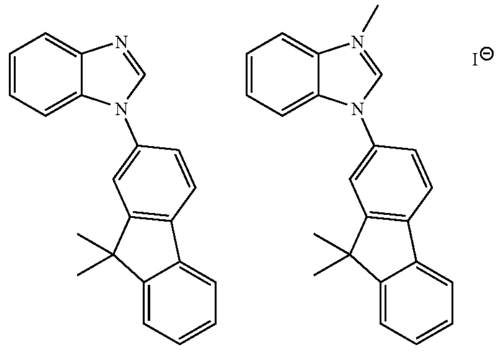
Step 3: Synthesis of 1,(2-iodo-9,9-dimethylfluorenyl)benzimidazole

A three neck 250 mL round bottomed flask was charged with 8.42 g (1.2 molar equivalent) benzimidazole, 2.13 g (20 mol %) 1,10-phenanthroline and 40.6 g (2.1 molar equivalent) cesium carbonate. Argon was then allowed to flow over the material for about 10 mins. While Argon was still flowing, 1.12 g (10 mol %) copper iodide was added to the mixture in the dark. The three-neck flask was covered with aluminum foil to protect the reaction mixture from light. 19 g (30 mmol) 2-iodo-9,9-dimethyl-fluorene, was dissolved in 20 mL of anhydrous dimethylformamide (DMF) and added to the mixture via a syringe through the septum. 20 mL of DMF was then further added to allow the mixture to stir. The reaction mixture was heated to 110° C. for 48 hours. After cooling, the mixture was filtered using vacuum filtration. The residue was washed with ethyl acetate and the filtrate concentrated under vacuo. A flash column was performed using hexanes (to get rid of any unreacted 2-iodo-9,9-dimethyl-fluorene, the product stayed in the column). Following the hexanes, a new receiving flask was placed under the column and the eluent was changed to ethylacetate to give the product 12.0 g (66% yield) of product.



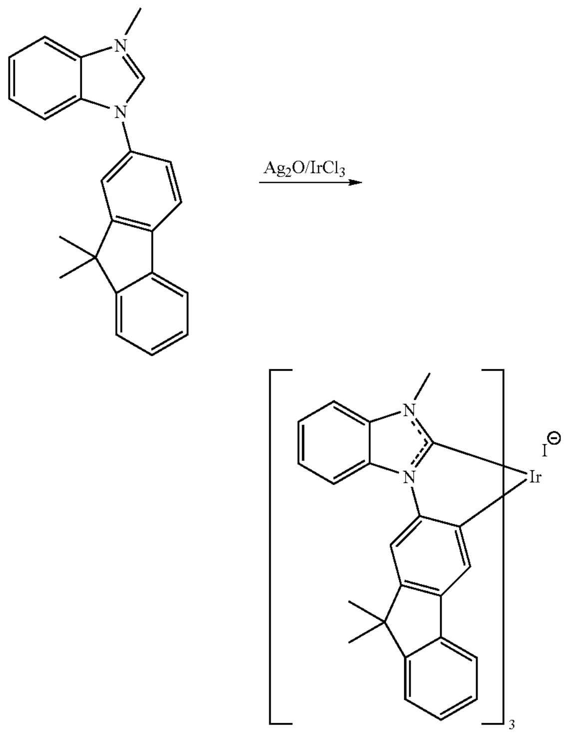
Step 4: Synthesis of [1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolate]iodide

2.3 mL (34 mmol) methyl iodide was syringed into a 250 mL round-bottomed flask charged with 5 g (16 mmol) 1,(2-iodo-9,9-dimethylfluorenyl)benzimidazole and 50 mL toluene. The reaction was stirred and heated to 30° C. for 24 hours. The white precipitate was filtered and washed with toluene to give 7.0 g (99% yield) of product.



Step 5: Synthesis of mer-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$ and fac-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$

A 250 mL round-bottomed flask was charged with 1.53 g (11 mmol) silver(I) oxide, 5.0 g (11 mmol) [1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolate]iodide and 0.66 g (3.6 mmol) iridium(III)trichloride hydrate and 100 mL of dichloroethane. The reaction was stirred and heated at 80° C. for 24 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Flash column chromatography on silica gel using dichloromethane as the eluent was done to give a 1.9 g (45% yield) of a 70/30 ratio of the mer/fac isomers of the tris Ir(III) product.



mer and fac isomers

Separation of the fac and mer isomers was accomplished by column chromatography using 50/50 ethylacetate and hexanes as the eluent.

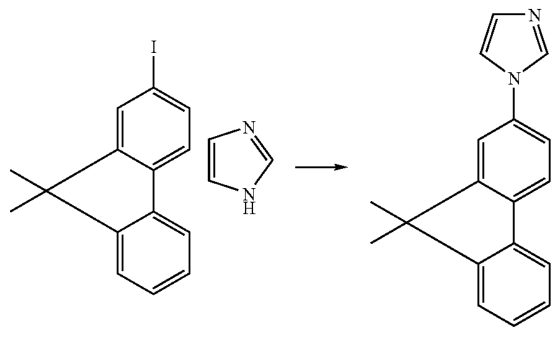
Example 14

Synthesis of 3:1 mixture of mer:fac-iridium(III) tris [1,(9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$

Step 1 and Step 2: Same as Example 13

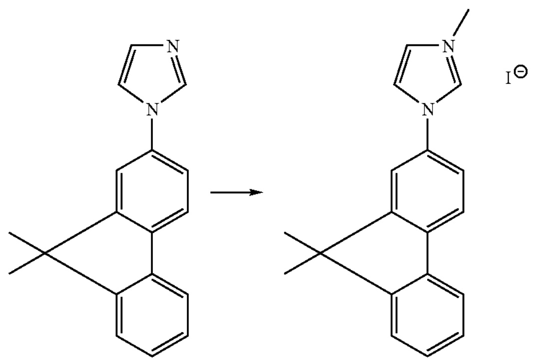
Step 3: Synthesis of 1,(9,9-dimethylfluorenyl)imidazole

A three neck 250 mL round bottomed flask was charged with 5.10 g (1.2 molar equivalent) imidazole, 2.13 g (20 mol %) 1,10-phenanthroline and 40.6 g (2.1 molar equivalent) cesium carbonate. Argon was then allowed to flow over the material for about 10 mins. While Argon was still flowing, 1.12 g (10 mol %) copper iodide was added to the mixture in the dark. The three-neck flask was covered with aluminum foil to protect the reaction mixture from light. 20.0 g (62 mmol) 2-iodo-9,9-dimethyl-fluorene, was dissolved in 20 mL of anhydrous dimethylformamide (DMF) and added to the mixture via a syringe through the septum. 20 mL of DMF was then further added to allow the mixture to stir. The reaction mixture was heated to 110° C. for 48 hours. After cooling, the mixture was filtered using vacuum filtration. The residue was washed with ethyl acetate and the filtrate concentrated under vacuo. A flash column was performed using hexanes (to get rid of any unreacted 2-iodo-9,9-dimethyl-fluorene, the product stayed in the column). Following the hexanes, a new receiving flask was placed under the column and the eluent was changed to ethylacetate to give the product 10.0 g (62% yield) of product.

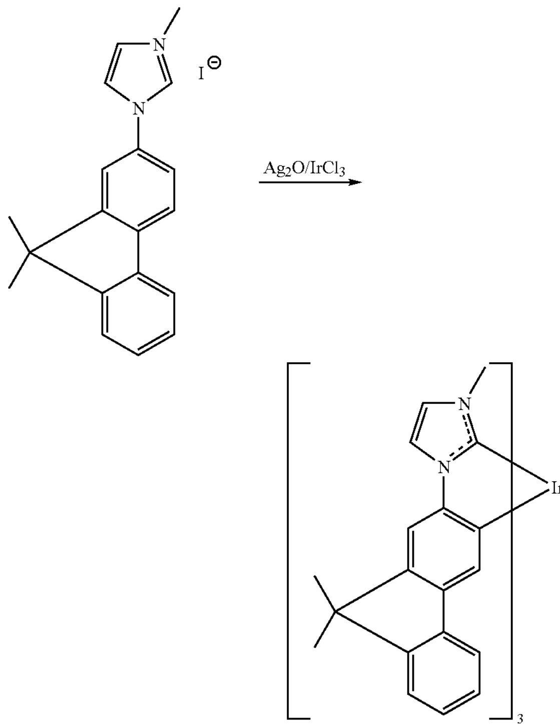


Step 4: Synthesis of [1,(9,9-dimethylfluorenyl)-3-methyl-imidazolate]iodide

2.3 mL (34 mmol) methyl iodide was syringed into a 250 mL round-bottomed flask charged with 5 g (16 mmol) 1,(9, 9-dimethylfluorenyl)imidazole and 50 mL toluene. The reaction was stirred and heated to 30° C. for 24 hours. The white precipitate was filtered and washed with toluene to give 7.0 g (99% yield) of product.



Step 5: Synthesis of 3:1 mixture of mer:fac-iridium(III) tris[1,(9,9-dimethylfluorenyl)-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$. A 250 mL round-bottomed flask was charged with 1.53 g (11 mmol) silver(I) oxide, 5.0 g (11 mmol) [1,(9, 9-dimethylfluorenyl)-3-methyl-imidazolate]iodide and 0.66 g (3.6 mmol) iridium(III)trichloride hydrate and 100 mL of 2-ethoxyethanol. The reaction was stirred and heated at 80° C. for 24 hours under nitrogen while protected from light with aluminum foil. The reaction mixture was cooled to ambient temperature and concentrated under reduced pressure. Flash column chromatography on silica gel using dichloromethane as the eluent was done to give a 1.7 g (42% yield) of a 3:1 ratio of the mer/fac isomers of the tris Ir(III) product.



3:1mer:fac isomers

Device Fabrication and Measurement

All devices were fabricated by high vacuum (<10^{-7} Torr) thermal evaporation. The anode electrode was ~1200 Å of indium tin oxide (ITO). The cathode consisted of 10 Å of LiF followed by 1,000 Å of Al. All devices were encapsulated with a glass lid sealed with an epoxy resin in a nitrogen glove box (<1 ppm of H_2O and O_2) immediately after fabrication, and a moisture getter was incorporated inside the package. The electron transporting layer(s) (EML) after the emissive layer consisted of either one layer (ETL2) or 2 layers (ETL2 and ETL1).

Device spectral measurements were done using a PR-705 spectroradiometer manufactured by Photoresearch Inc. Incoming light was focused into the camera and was dispersed by a holographic diffraction grating. The dispersed spectrum was measured by a thermo-electrically cooled silicon diode array detector. The cooled detector was housed in a hermetically sealed, pressurized chamber allowing the instrument to make stable and repeatable measurements. Two onboard microprocessors controlled the hardware and mathematically calculated photometric and calorimetric values for the acquired spectral data during a measurement. The PR-705 measured accurate luminance in the visible spectral range from 380-780 nm.

Example 15

The organic stack consisted of sequentially, from the ITO surface, 100 Å of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 6 wt % of Iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$) as the emissive layer (EML), 100 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2, and 400 Å of tris(8-hydroxyquinolinato)aluminum (Alq_3) as the ETL1.

Comparative Example 1

The organic stack consisted of sequentially, from the ITO surface, 100 Å of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL1), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 4.5 wt % of Ir(5'-Phppy)$_3$ as the emissive layer (EML), 100 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2, and 400 Å of tris(8-hydroxyquinolinato)aluminum (Alq_3) as the ETL1.

Example 16

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 12 wt % of Iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,$C^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,$C^{2'}$) as the emissive layer (EML), 100 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2, and 400 Å of tris(8-hydroxyquinolinato)aluminum (Alq_3) as the ETL1.

Example 17

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 6 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Comparative Example 2

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 6 wt % of Ir(F_2ppy)$_3$ as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato) 4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 18

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 12 wt % of mer-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)-4-phenylphenolate (BAlq) as the ETL. There is no ETL1.

Example 19

The organic stack consists of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 6 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato) 4-phenylphenolate (BAlq) as the ETL1.

Example 20

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 12 wt % of mer-iridium(III) tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL1.

Example 21

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 6 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$]

as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Comparative Example 3

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 6 wt % of $Ir(F_2ppy)_3$ as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato) 4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 22

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 12 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 400 Å of aluminum(III)bis (2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 23

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD), as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 6 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato) 4-phenylphenolate (BAlq) as the ETL1.

Example 24

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 12 wt % of mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)-4-phenylphenolate (BAlq) as the ETL1.

Example 25

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 6 wt % of fac-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 26

The organic stack consists of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(N-carbazolyl)benzene (mCP) doped with 6 wt % of fac-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,$C^{2'}$] as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato) 4-phenylphenolate (BAlq) as the ETL1.

Example 27

The organic stack consists of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 50 Å of $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$ as the electron blocking layer (EBL), 300 Å of 4,4'-bis(N-carbazolyl)biphenyl (CBP) doped with 4.5 wt % of $Ir(5'\text{-}Phppy)_3$ as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 28

The organic stack consists of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$ as the emissive layer (EML), and 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 29

The organic stack consisted of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(triphenylsilyl)benzene (UGH) doped with 6 wt % of $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$ as the emissive layer (EML), 400 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL2. There is no ETL1.

Example 30

The organic stack consists of sequentially, from the ITO surface, 100 Å thick of copper phthalocyanine (CuPc) as the hole injection layer (HIL), 300 Å of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (α-NPD) as the hole transporting layer (HTL), 300 Å of 1,3-bis(triphenylsilyl)benzene (UGH) doped with 12 wt % of $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$ as the emissive layer (EML), 100 Å of HPT as the ETL2 and 300 Å of aluminum(III)bis(2-methyl-8-hydroxyquinolinato)4-phenylphenolate (BAlq) as the ETL1.

The external quantum efficiencies and the CIE coordinates of Examples 15-30 and Comparative Examples 1-3 are summarized in Table B.

TABLE B

Example	EML	Doping %	ETL2	ETL1	External quantum efficiency at 10 mA/cm^2 (%)	CIE
15	CBP: Iridium(III)bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)](1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$)	6	BAlq	Alq_3	7.2	0.30, 0.63
16	CBP: Iridium(III)bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)](1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$)	12	BAlq	Alq_3	5.35	0.30, 0.63
17	CBP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	BAlq	none	0.4	0.17, 0.33
18	CBP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	12	BAlq	none	0.5	0.18, 0.37
19	CBP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	HPT	BAlq	0.3	0.18, 0.32
20	CBP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	12	HPT	BAlq	0.4	0.18, 0.37
21	mCP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	BAlq	none	2.2	0.17, 0.37
22	mCP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	12	BAlq	none	1.3	0.17, 0.36
23	mCP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	HPT	BAlq	2.1	0.18, 0.40
24	mCP: mer-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	12	HPT	BAlq	2.5	0.18, 0.40
25	mCP: fac-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	BAlq	none	1.4	0.17, 0.33
26	mCP: fac-iridium(III)tris[1,(2-iodo-9,9-dimethylfluorenyl)-3-methyl-benzimidazolin-2-ylidene-C,C$^{2'}$]	6	HPT	BAlq	1.4	0.17, 0.36
27	CBP: $Ir(5'\text{-}Phppy)_3$	4.5	BAlq	Alq_3	11.8	0.30, 0.65
28	$Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$	neat layer	BAlq	none	0.6	0.19, 0.36
29	UGH: $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$	12	BAlq	none	1.3	0.17, 0.20
30	UGH: $Ir(1\text{-}Ph\text{-}3\text{-}Me\text{-}imid)_3$	12	HPT	BAlq	1	0.17, 0.18
Comparative example 1	CBP: $Ir(5'\text{-}Phppy)_3$	4.5	BAlq	Alq_3	7.1	0.31, 0.64
Comparative example 2	CBP: $Ir(F_2ppy)_3$	6	BAlq	none	0.5	0.17, 0.30
Comparative example 3	mCP: $Ir(F_2ppy)_3$	6	BAlq	none	4	0.16, 0.36
Comparative example 4	UGH	Neat layer	BAlQ	None	0.4	0.15, 0.12

FIG. **27** shows the external quantum efficiency vs. current density of examples 15-16 and comparative example 1. FIG. **28** shows the electroluminescence spectra of examples 15-16 and comparative example 1 at 10 mA/cm^2. It can be seen that the device efficiency and emission color are similar for Iridium(III) bis[(2-(5'-biphenyl)-2-pyridinato-N,C$^{2'}$)] (1-phenyl-3-methyl-imidazolin-2-ylidene-C,C$^{2'}$) and $Ir(5'\text{-}Phppy)_3$. FIG. **29** shows the operational stability of example 15 vs comparative example 1. The halflife, $T_{1/2}$, defined as the time required for the electroluminescence to drop to 50% of its initial value, is ~200 hrs for comparative example 1. This is slightly longer than that of example 10 (~120 hrs).

FIG. **30** shows the external quantum efficiency vs. current density of examples 17-20. FIG. **31** shows the electroluminescence spectra of examples 17-20. It can be seen these devices with CBP as the host emit light blue color with 0.3 to 0.7% external quantum efficiency.

FIG. **32** shows the external quantum efficiency vs. current density of examples 21-24. FIG. **33** shows the electroluminescence spectra of examples 21-24. It can be seen these devices with mCP as the host emit light blue color with 1.4 to 3.4% external quantum efficiency which are higher than examples 17-20 which have the exact device structure except that example 17-20 use CBP as the host.

FIG. **34** shows the external quantum efficiency vs. current density of examples 25 and 26. FIG. **35** shows the electroluminescence spectra of examples 25 and 26. Examples 25 and 26 devices are analogous to examples 21 and 23 respectively. The difference is that examples 16 and 17 utilize the facial isomer of the invention compound, whereas examples 21 and 23 utilize the meridional isomer of the invention compound. They all utilize mCP as the host. It can been seen that devices with the meridional isomer are more efficient than devices with the facial isomer (see Table B) in this device structure.

FIG. **36** shows the external quantum efficiency vs. current density of example 27. FIG. **37** shows the electroluminescence spectra of example 27. It can be seen the device with Ir(1-Ph-3-Me-imid)$_3$ as the electron blocking layer has a device efficiency of 11.8% at 10 mA/cm^2, significantly enhanced from 7.1% at 10 mA/cm^2 obtained from comparative example 1 which does not utilize an electron blocking layer.

FIG. **38** shows the external quantum efficiency vs. current density of example 28. FIG. **39** shows the electroluminescence spectra of example 28. It can be seen the device does not emit through Ir(1-Ph-3-Me-imid)$_3$ but rather through BAlq, which is the layer next to the Ir(1-Ph-3-Me-imid)$_3$ layer. It suggests hole transport is the dominant role of the Ir(1-Ph-3-Me-imid)$_3$ layer in this device structure.

FIG. **40** shows the external quantum efficiency vs. current density of example 29 and 30. FIG. **41** shows the electroluminescence spectra of example 29 and 30. The device structures of examples 29 and 30 include the compound Ir(1-Ph-3-Me-imid)$_3$ doped into the high energy host, UGH. The devices have different ETL layers. Example 29 has only a BAlQ ETL, and example 30 has a 100 Å layer of hole blocking HPT followed by BAlQ. HPT is believed to be an effective hole blocking material. In these devices, high energy emission is observed with peak intensities at 384 nm and 404 nm. Additional peaks are observed at 429 nm, 451 nm, and 503 nm. A comparison of the PL spectra of the dopant (FIG. **18**) and the EL spectra (FIG. **41**), suggests that the high energy peaks are believed to be attributable to emission from the dopant.

FIG. **43** shows the quantum efficiency vs. current density for comparative example 4. FIG. **44** shows the normalized electroluminescence spectra for Comparative example 4, which has a similar device structure to example 29 using the UGH host except the host is not doped. It can be seen that the device of comparative example 4 emits almost entirely from the NPD HTL layer and has an EL peak intensity at 440 nm. It is believed that the emission from the NPD is due to the fact that UGH acts as a poor hole conductor. Therefore, all recombination may take place at the NPD/UGH interface. It can be seen from FIG. **41** that the device having an undoped UGH host in comparative example 4 has no high energy peaks below 440 nm, as was observed in the devices with the doped UGH hosts of examples 29 and 30.

FIG. **42** shows the subtracted EL spectra of example 29 from example 30. This is also shown as the shaded region between the EL spectra of examples 29 and 30. It can be seen that the difference between the devices appears to be an additional contribution from the emission of BAlQ emission in example 29. BAlQ emits with a Gaussian shape and has a peak intensity at 480 nm, which looks very similar to the spectral difference. BAlQ may emit in the device of example 29 because Ir(1-Ph-3-Me-imid)$_3$ may act as a good hole conductor allowing for recombination to take place in the BAlQ layer near the interface with the emissive layer. The addition of the HPT hole blocking material may prevent hole electron recombination from taking place in BAlQ resulting in the spectral difference between examples 29 and 30.

The addition of another layer between NPD and the emissive layer may be desirable to increase the emission from the dopant. It has been shown in R. J. Holmes et al. *APL* 2003, 83, 3818), which is incorporated by reference in its entirety, that a layer of mCP inserted between NPD and the emissive layer may be necessary to reduce NPD emission and improve efficiency. Holmes describes a device using a blue emitting dopant in a high energy aryl-silane host which is a structural isomer of the UGH host used in examples 29 and 30. It is believed that similar device modifications for UGH: Ir(1-Ph-3-Me-imid)$_3$ would have a comparable effect. Thus the insertion of different materials between NPD and the UGH: Ir(1-Ph-3-Me-imid)$_3$ emissive layer may improve the intensity and spectral contribution from the UV emitting dopant.

While the present invention is described with respect to particular examples and preferred embodiments, it is understood that the present invention is not limited to these examples and embodiments. The present invention as claimed therefore includes variations from the particular examples and preferred embodiments described herein, as will be apparent to one of skill in the art.

What is claimed is:

1. An organic light emitting device, comprising an anode, a cathode and a phosphorescent emissive layer disposed between the anode and the cathode, wherein the phosphorescent emissive layer comprises a phosphorescent emissive material; and wherein the phosphorescent emissive material comprises a cyclometallated, five-membered ring, which includes a metal atom bound to two carbon atoms within the ring, wherein one of the metal-carbon bonds is a metal-carbene bond and the other is a metal-mono-anionic carbon bond.

2. The organic light emitting device of claim **1**, wherein the highest peak wavelength in the in-solution emission spectrum of the phosphorescent emissive material is less than 450 nm.

3. The organic light emitting device of claim **2**, wherein the highest peak wavelength in the in-solution emission spectrum of the phosphorescent emissive material less than 440 nm.

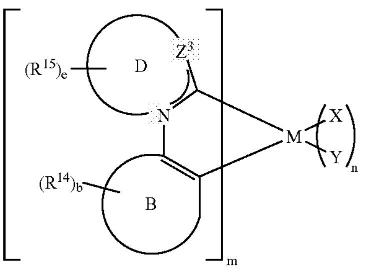
4. The organic light emitting device of claim **2**, wherein the highest peak wavelength in the in-solution emission spectrum of the phosphorescent emissive material is less than 390 nm.

5. The organic light emitting device of claim **1**, wherein the device emits at room temperature.

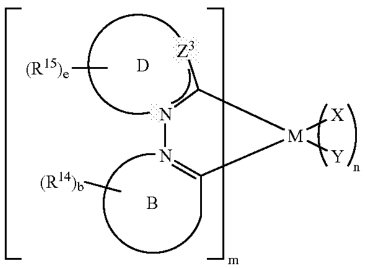
6. The organic light emitting device of claim **1**, wherein the metal is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Au, and Ag.

7. The organic light emitting device of claim **6**, wherein the metal is Ir.

8. The organic light emitting device of claim **1**, wherein the phosphorescent emissive material has the structure:



or,



wherein

M is a metal;

(X-Y) is selected from a photoactive ligand or an ancillary ligand;

Z^3 is selected from the group consisting of O, S, N—R^6, or P—R^6, wherein R^6 is selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', SO_3R', halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; and

ring B is independently an aromatic cyclic, heterocyclic, fused cyclic, or fused heterocyclic ring with at least one carbon atom coordinated to metal M, wherein ring B can be optionally substituted with one or more substituents R^{14}; and

ring D is independently a heterocyclic or fused heterocyclic ring with at least one carbon atom coordinated to metal M, wherein ring B can be optionally substituted with one or more substituents R^{15}; and

R^{14} and R^{15} are independently selected from alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', SO_3R', halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; or

alternatively, two R^{14} groups on adjacent ring atoms and R^{15} groups on adjacent ring atoms form a fused 5- or 6-membered cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents J;

m is a value from 1 to the maximum number of ligands that may be attached to the metal;

m+n is the maximum number of ligands that may be attached to metal M;

b is 0, 1, 2, 3, or 4; and

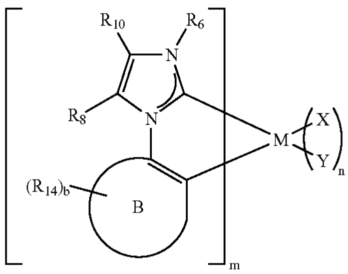
e is 0, 1, 2, or 3.

9. The organic light emitting device of claim **8**, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Au, and Ag.

10. The organic light emitting device of claim **9**, wherein M is Ir.

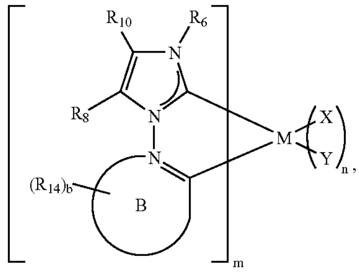
11. The organic light emitting device of claim **10**, wherein m is 3 and n is 0.

12. The organic light emitting device of claim **8**, wherein the phosphorescent emissive material has the structure:



or

-continued



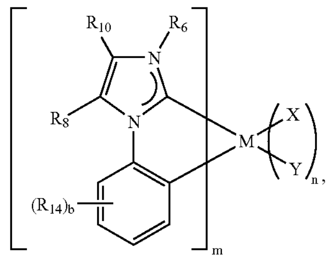
wherein R_8 and R_{10} are independently selected from the group consisting of H, alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', SO_3R', halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl.

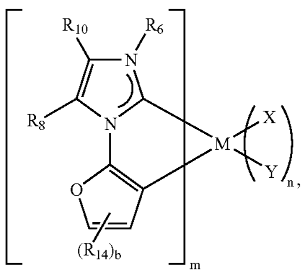
13. The organic light emitting device of claim **12**, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Au, and Ag.

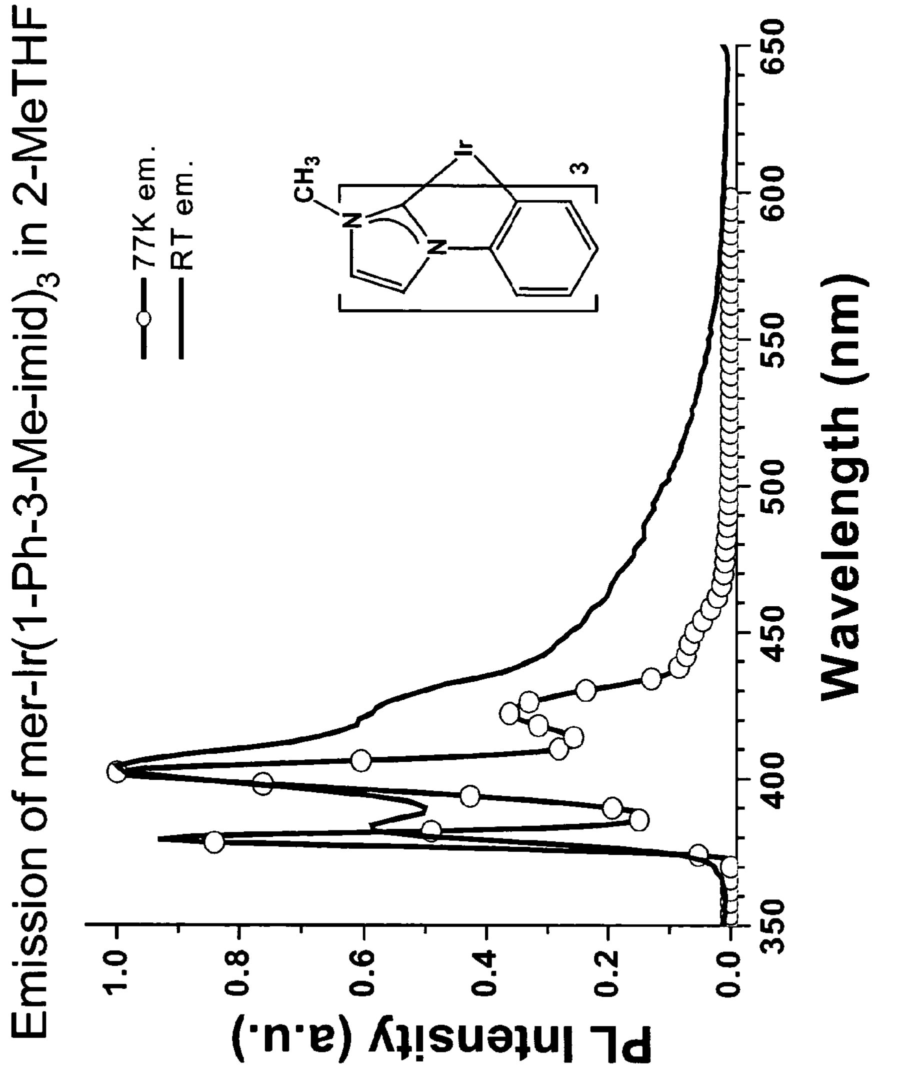
14. The organic light emitting device of claim **13**, wherein M is Ir.

15. The organic light emitting device of claim **12**, wherein m is 3 and n is 0.

16. The organic light emitting device of claim **12**, wherein the phosphorescent emissive material has the structure:



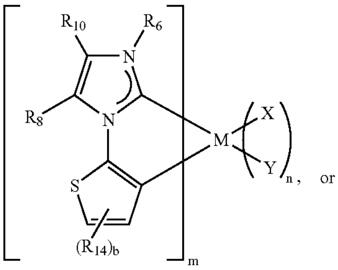


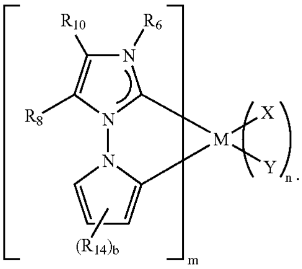


Emission of mer-Ir(1-Ph-3-Me-imid)3 in 2-MeTHF
77K em.
RT em.
CH3
N
N
Ir
3
PL Intensity (a.u.)
1.0
0.8
0.6
0.4
0.2
0.0
350
400
450
500
550
600
650
Wavelength (nm)

Figure 18

-continued



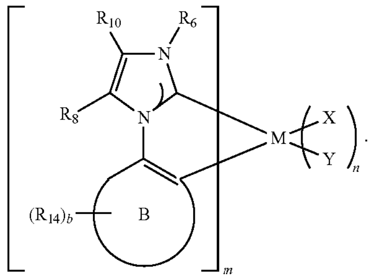


17. The organic light emitting device of claim 16, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Au, and Ag.

18. The organic light emitting device of claim 17, wherein M is Ir.

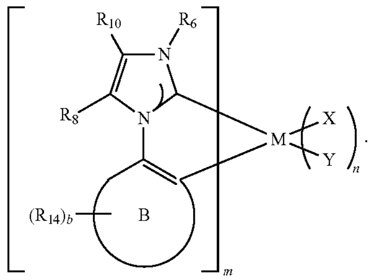
19. The organic light emitting device of claim 16, wherein m is 3 and n is 0.

20. The organic light emitting device of claim 12, wherein the phosphorescent emissive material has the structure:



21. The organic light emitting device of claim 20, wherein M is Ir or Pt.

22. The organic light emitting device of claim 12, wherein the phosphorescent emissive material has the structure:



23. The organic light emitting device of claim 22, wherein M is Ir or Pt.

* * * * *

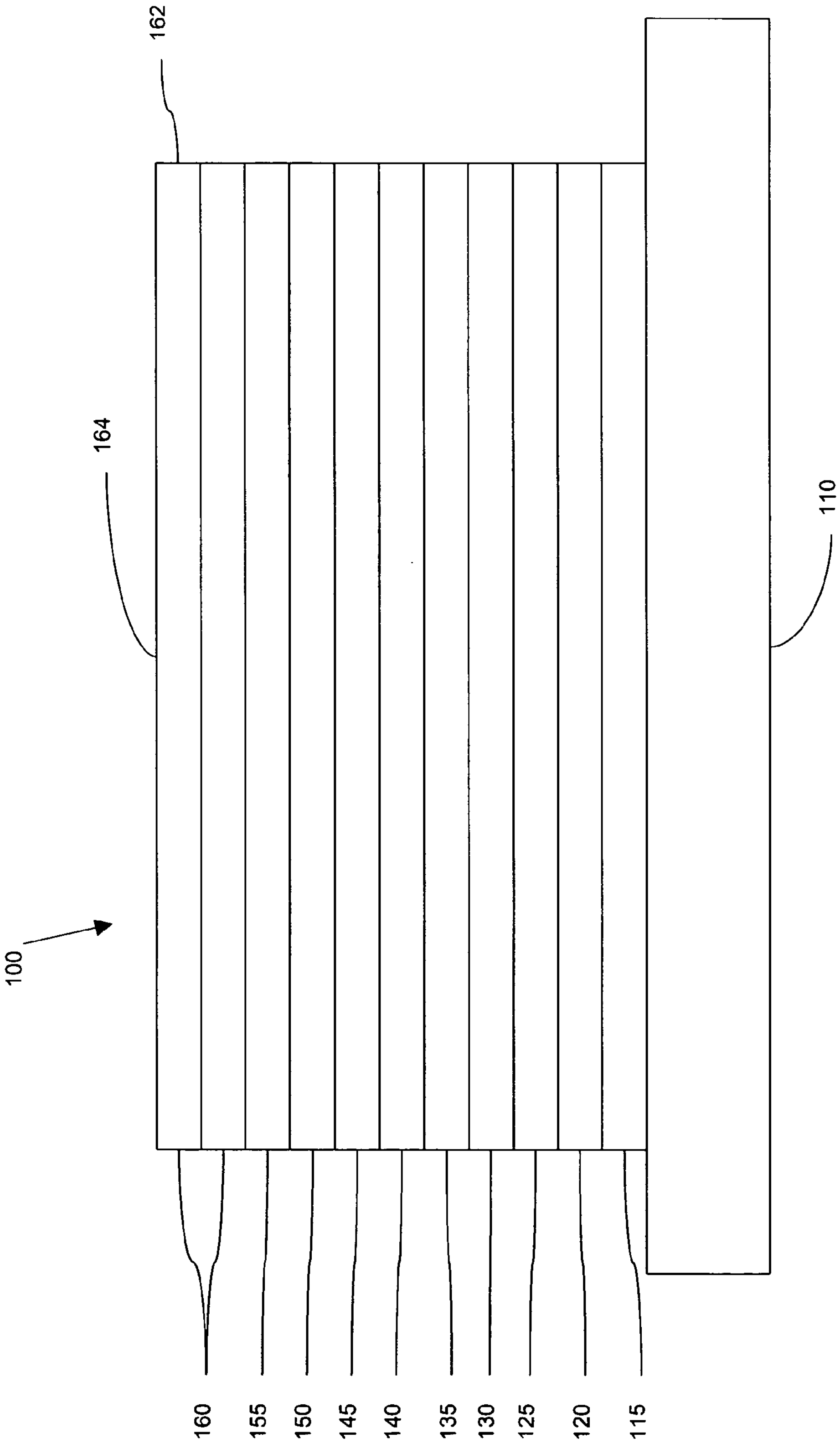


Figure 1

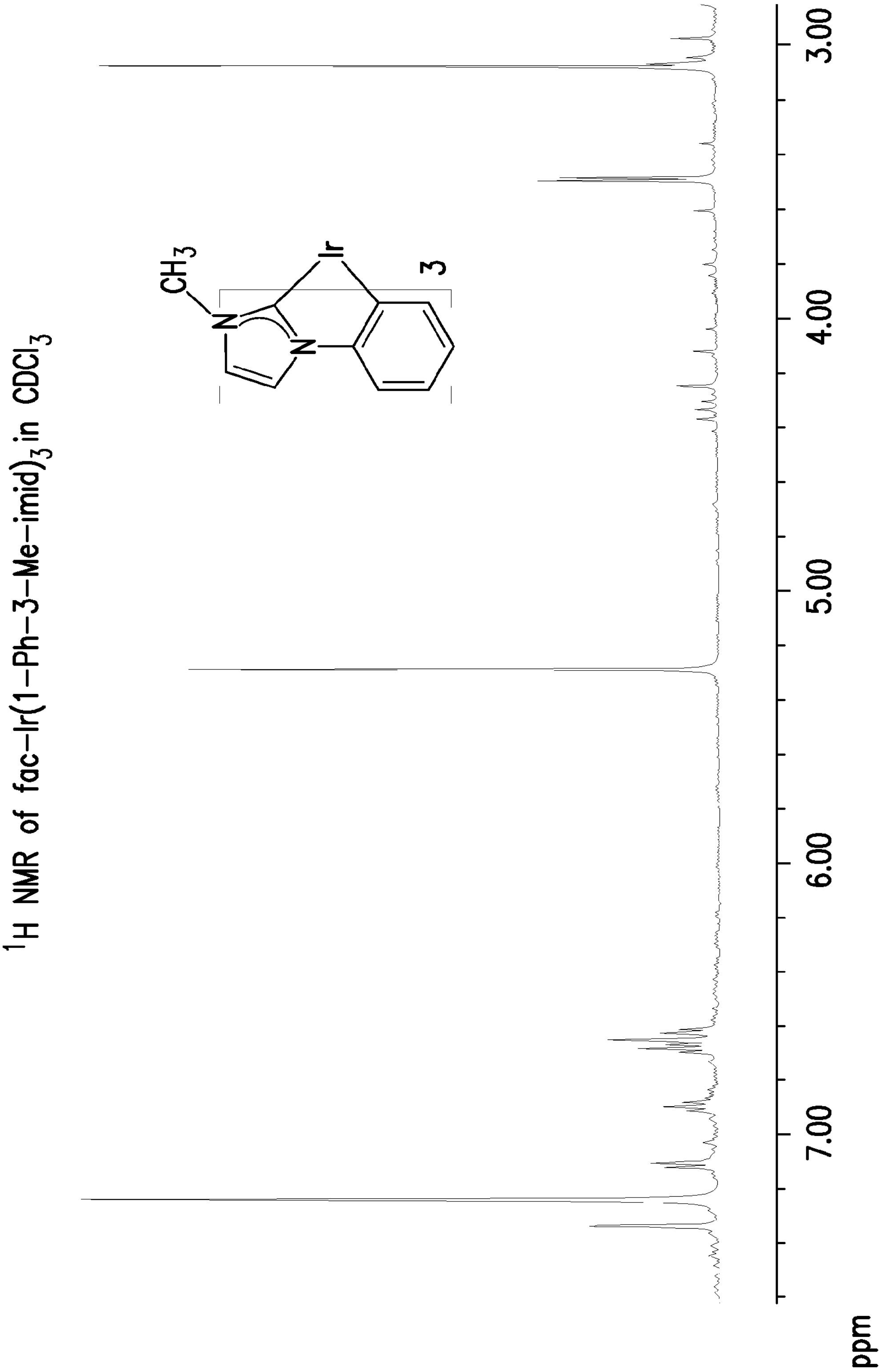

^{1}H NMR of fac-Ir(1-Ph-3-Me-imid)$_3$ in CDCl$_3$
CH3
N
Ir
3
3.00
4.00
5.00
6.00
7.00
ppm

FIG. 19

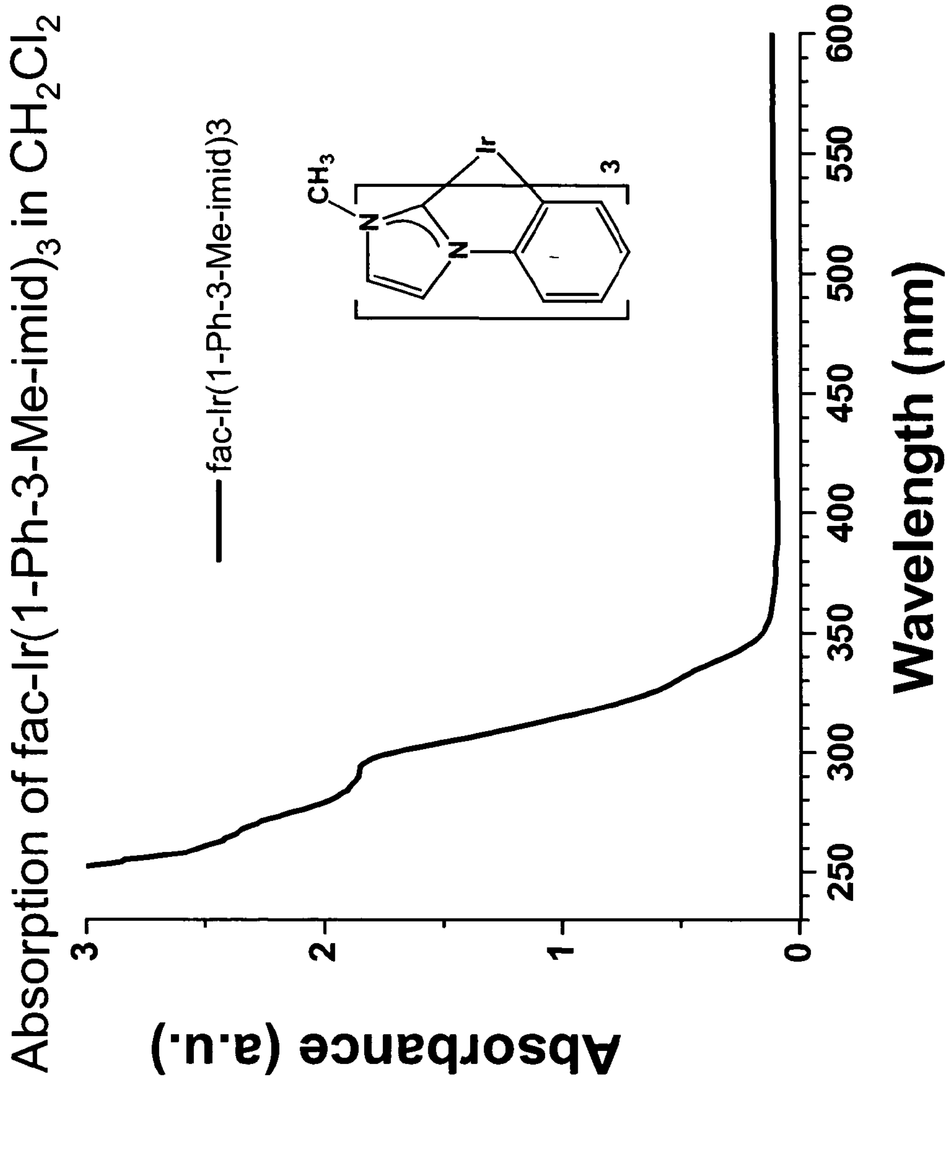

Absorption of fac-Ir(1-Ph-3-Me-imid)$_3$ in CH_2Cl_2
fac-Ir(1-Ph-3-Me-imid)3
CH_3
N
N
Ir
3
Absorbance (a.u.)
0
1
2
3
250
300
350
400
450
500
550
600
Wavelength (nm)

Figure 20

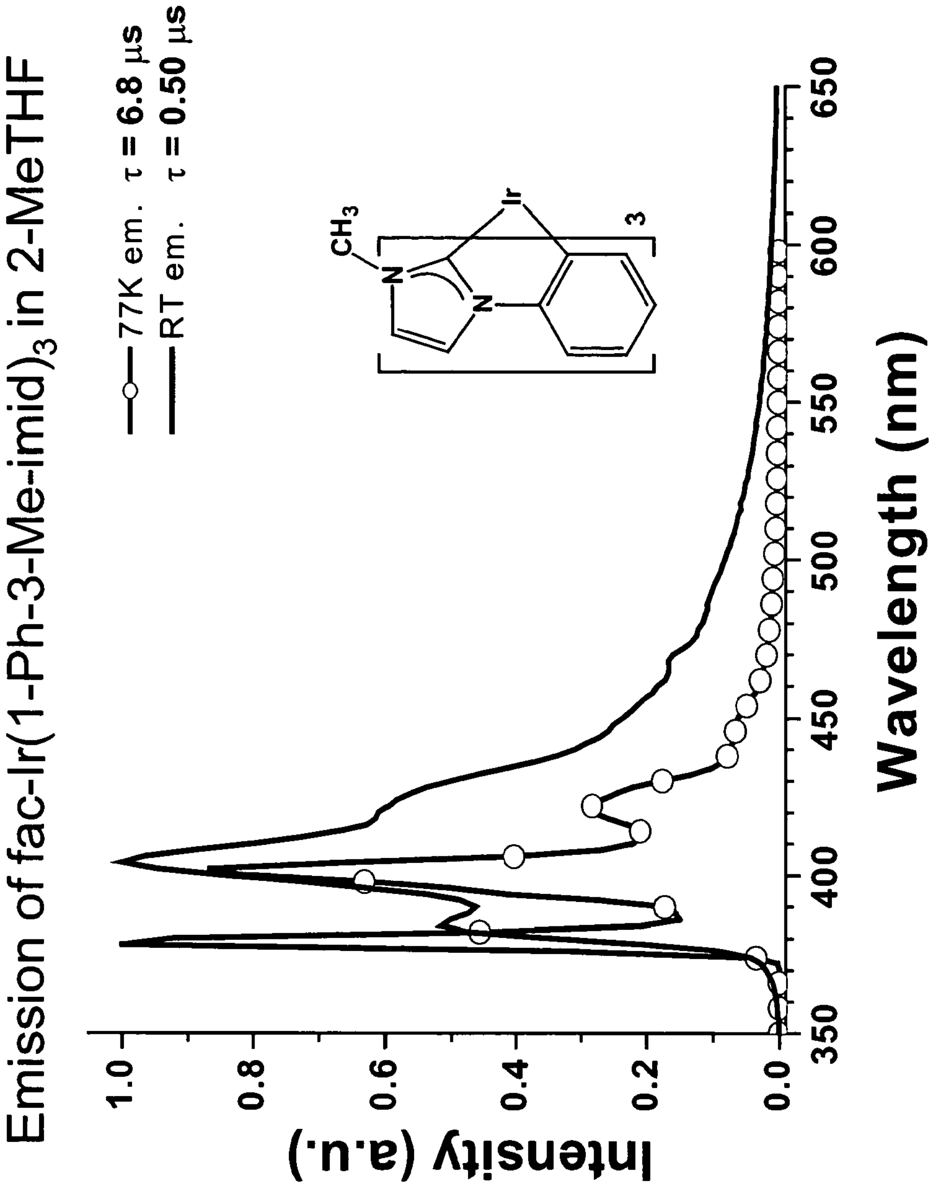

Emission of fac-Ir(1-Ph-3-Me-imid)$_3$ in 2-MeTHF
77K em. τ = 6.8 μs
RT em. τ = 0.50 μs
Intensity (a.u.)
0.0
0.2
0.4
0.6
0.8
1.0
Wavelength (nm)
350
400
450
500
550
600
650
CH$_3$
N
N
Ir
3

Figure 21

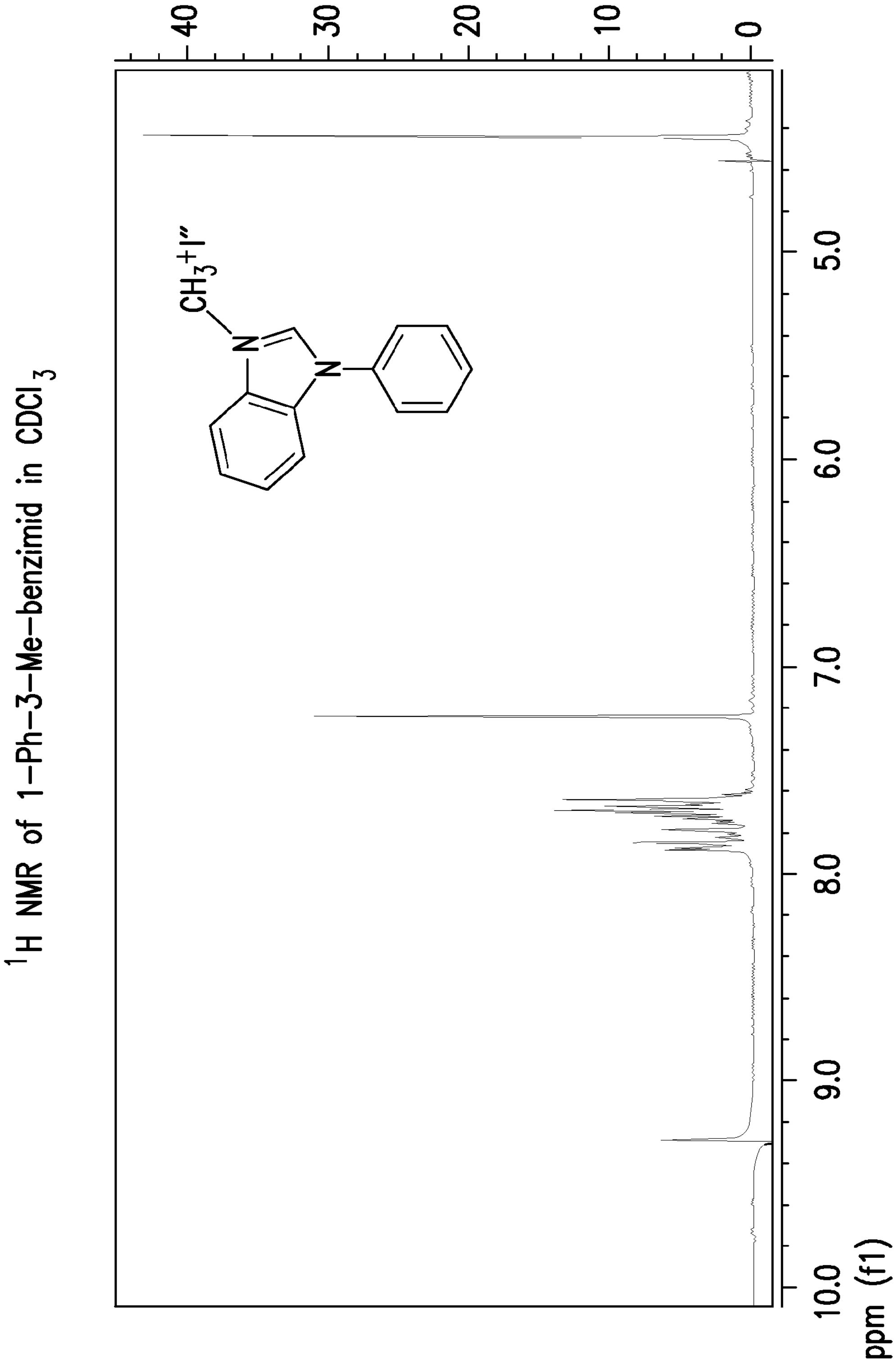

1H NMR of 1-Ph-3-Me-benzimid in CDCl3
CH3+I"
N
N
40
30
20
10
0
5.0
6.0
7.0
8.0
9.0
10.0
ppm (f1)

FIG. 22

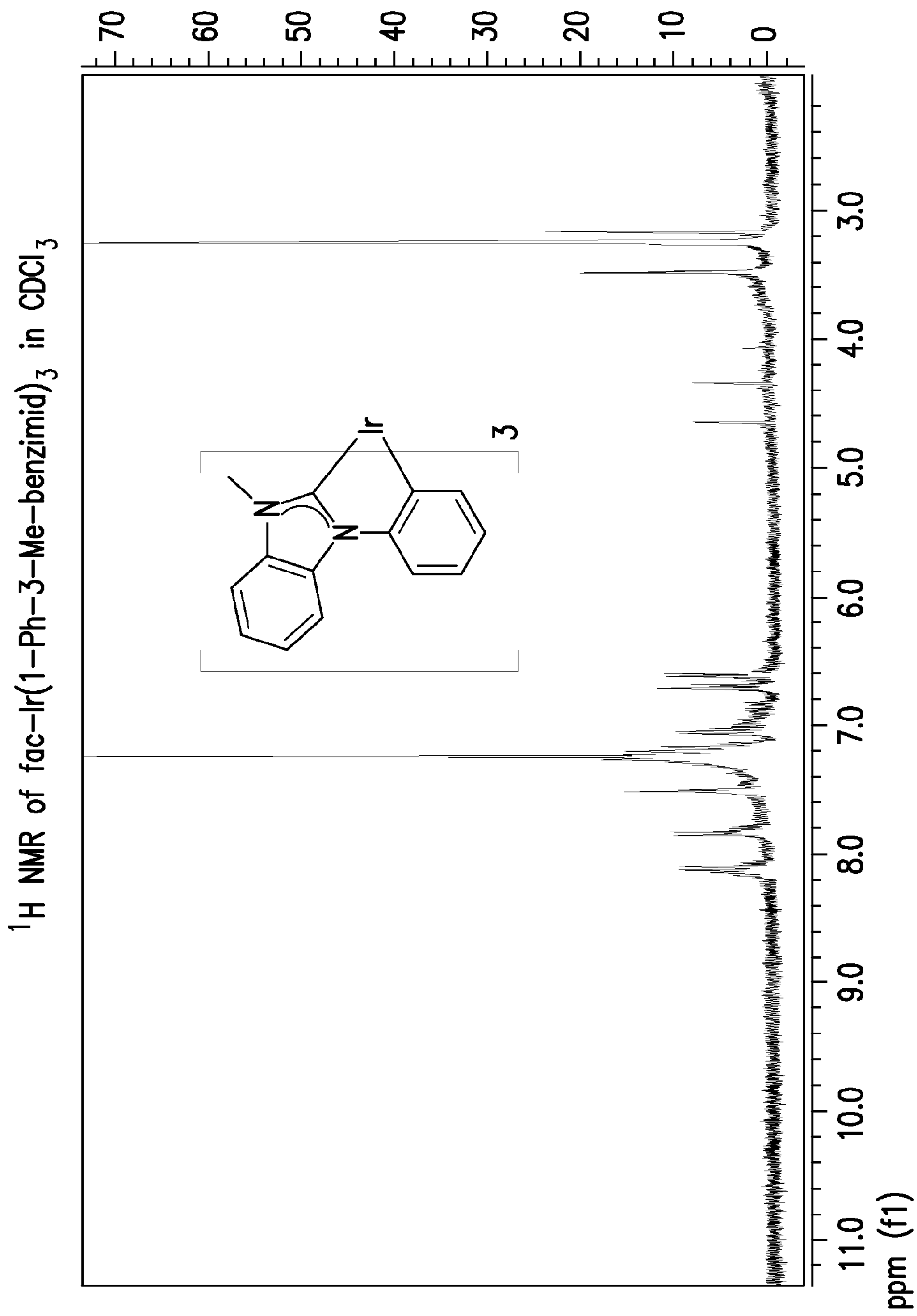

^{1}H NMR of fac-Ir(1-Ph-3-Me-benzimid)$_3$ in $CDCl_3$
70
60
50
40
30
20
10
0
N
N
Ir
3
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
ppm (f1)

FIG.23

Cyclic Voltammetry of fac-Ir(1-Ph-3-Me-benzimid)$_3$ in anhydrous DMF

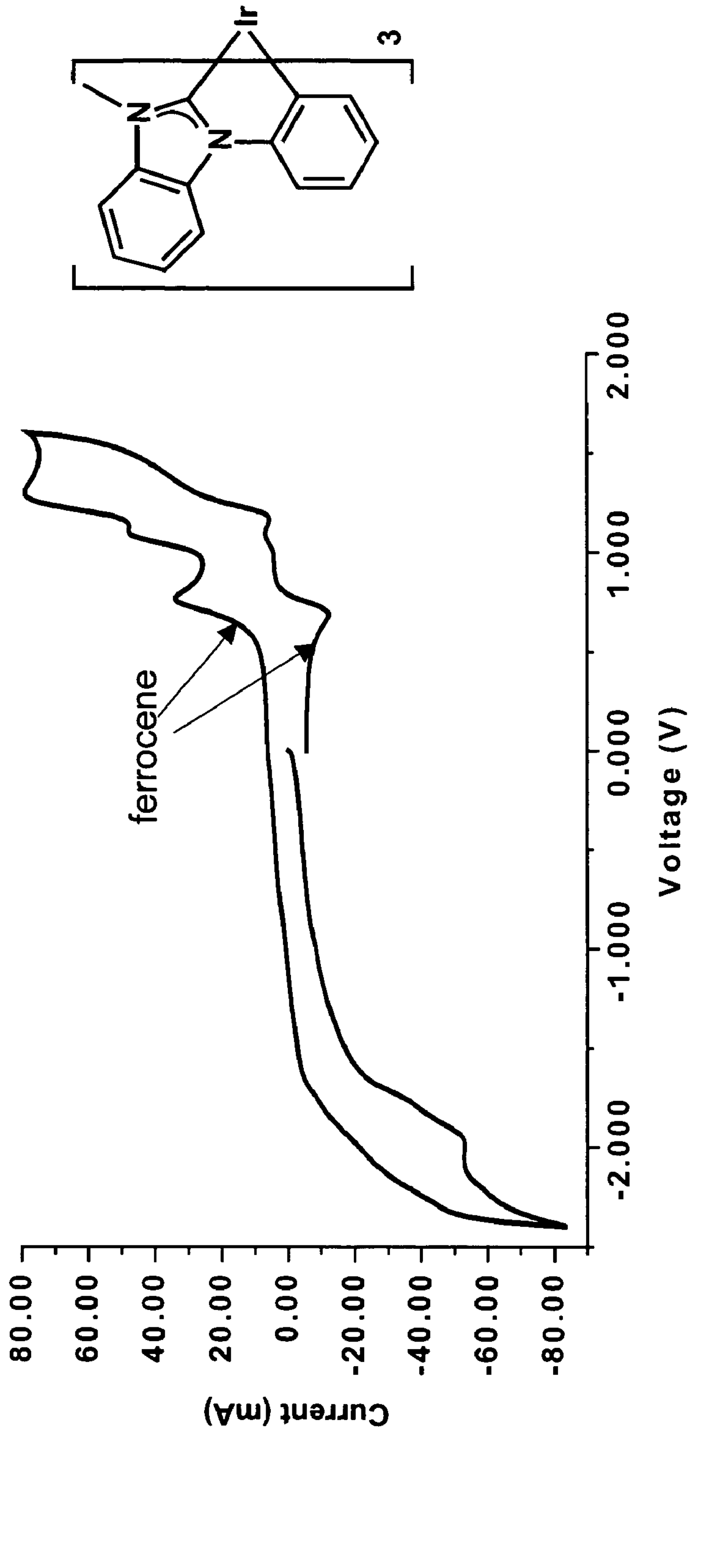


Figure 24

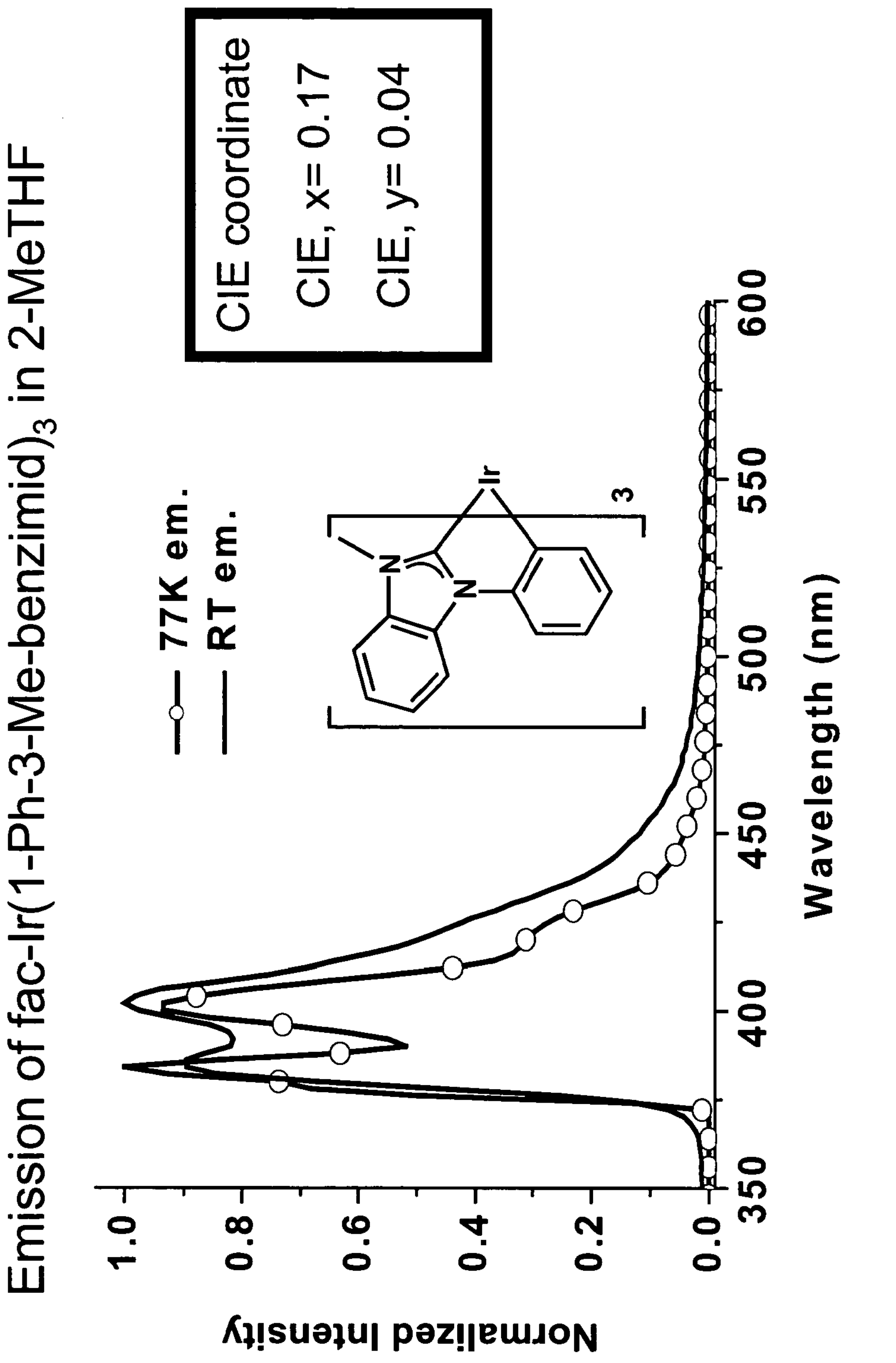

Emission of fac-Ir(1-Ph-3-Me-benzimid)$_3$ in 2-MeTHF
77K em.
RT em.
CIE coordinate
CIE, x= 0.17
CIE, y= 0.04
Ir
N
N
3
Normalized Intensity
1.0
0.8
0.6
0.4
0.2
0.0
350
400
450
500
550
600
Wavelength (nm)

Figure 25

Emission of a 3:1 mixture of mer: fac tris-Ir-Fl-Me-imid in 2-MeTHF

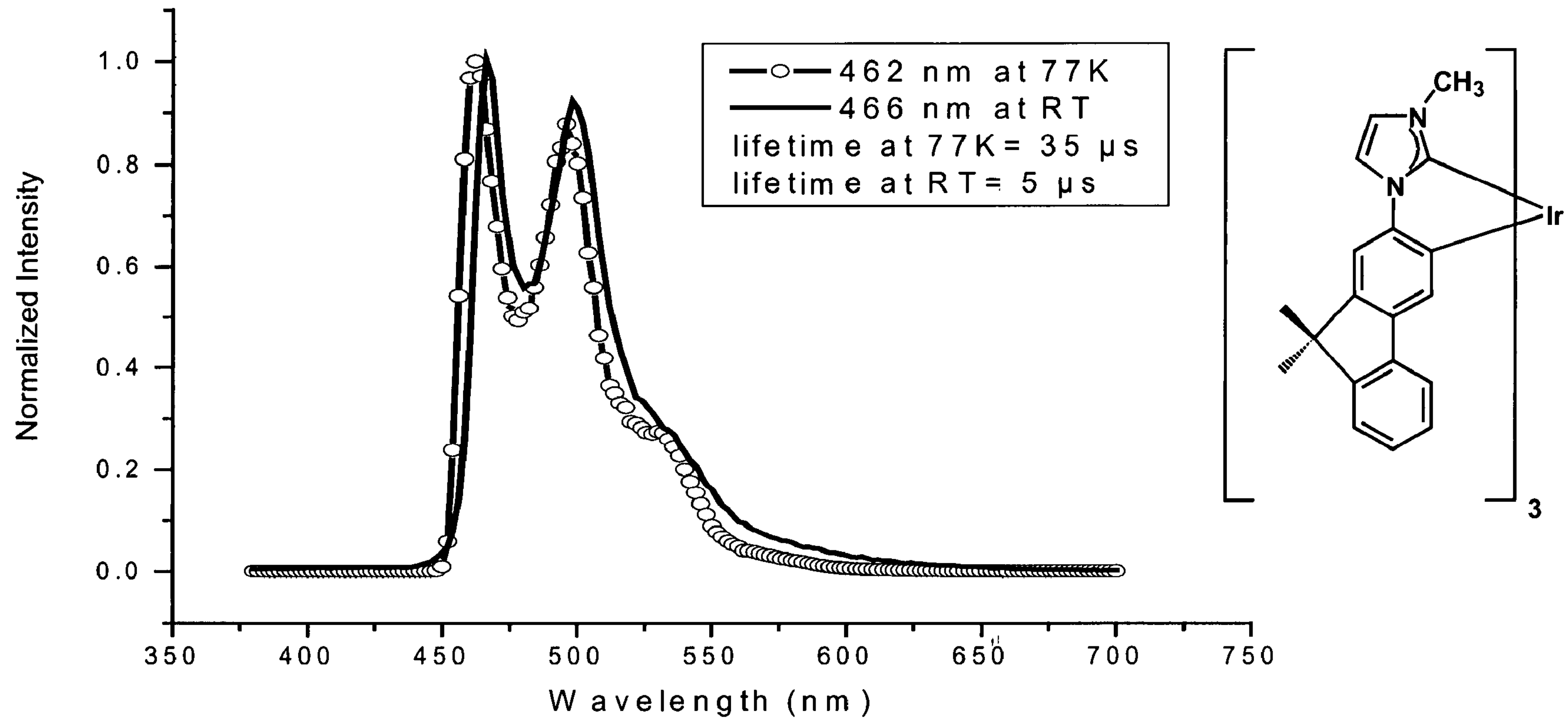
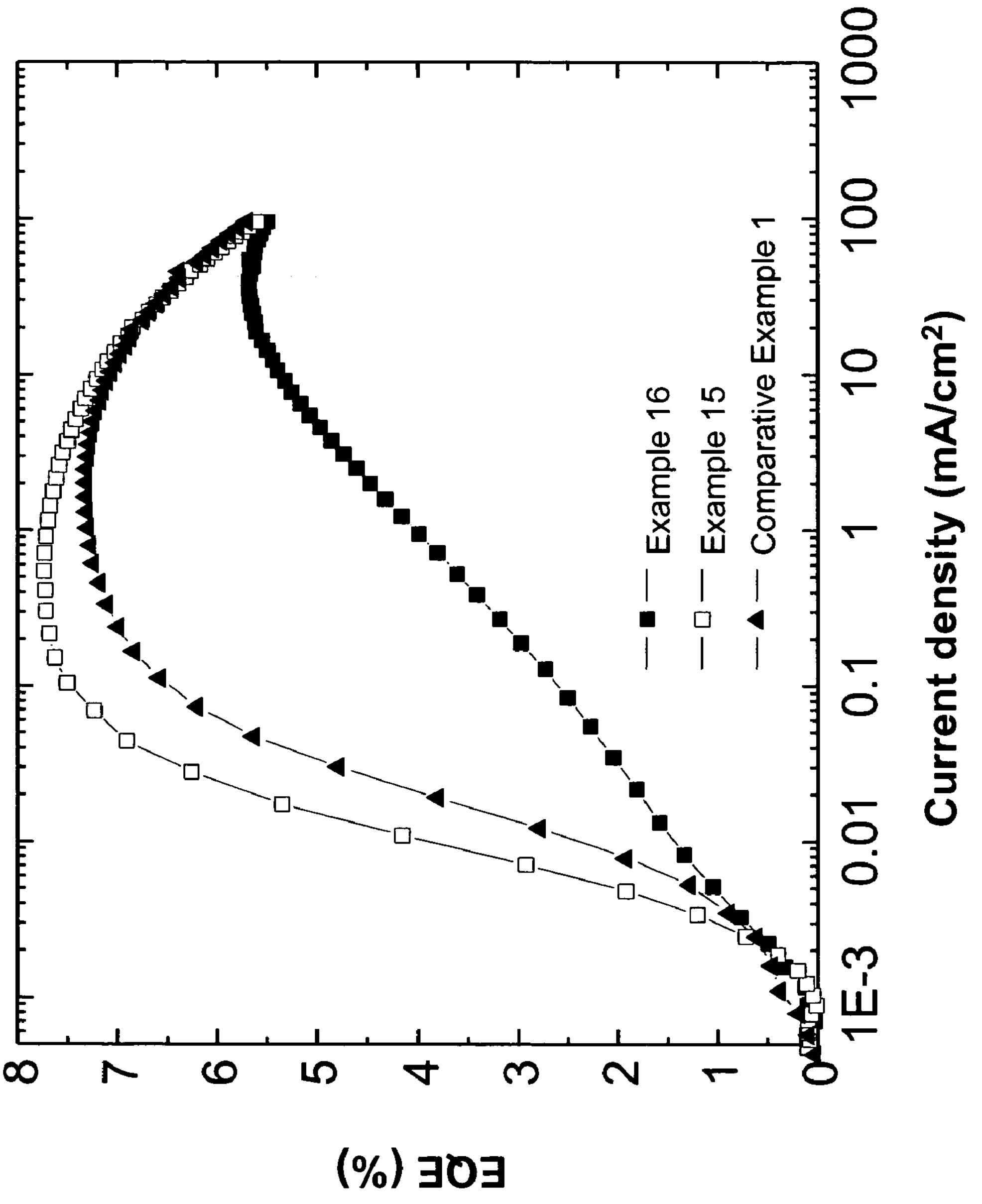


Figure 26



EQE (%)
0
1
2
3
4
5
6
7
8
1E-3
0.01
0.1
1
10
100
1000
Current density (mA/cm²)
Example 16
Example 15
Comparative Example 1

Figure 27

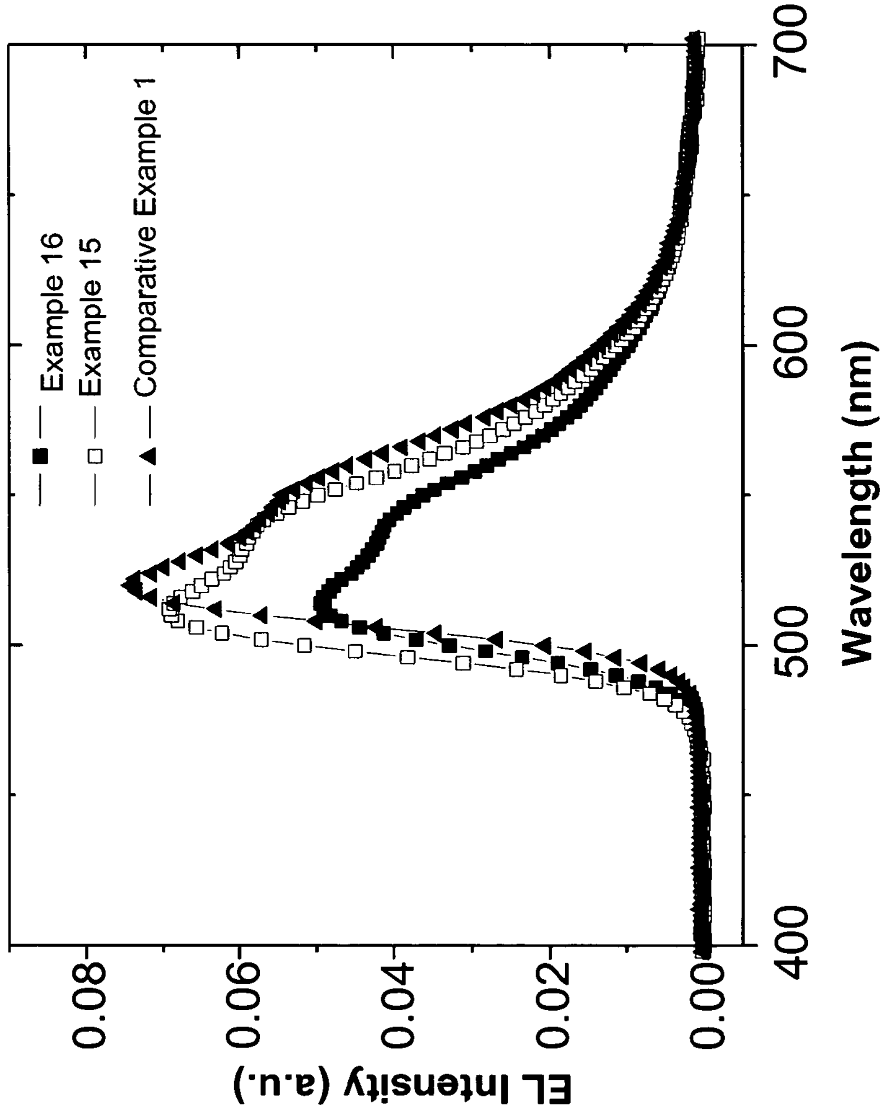

Example 16
Example 15
Comparative Example 1
EL Intensity (a.u.)
0.00
0.02
0.04
0.06
0.08
400
500
600
700
Wavelength (nm)

Figure 28

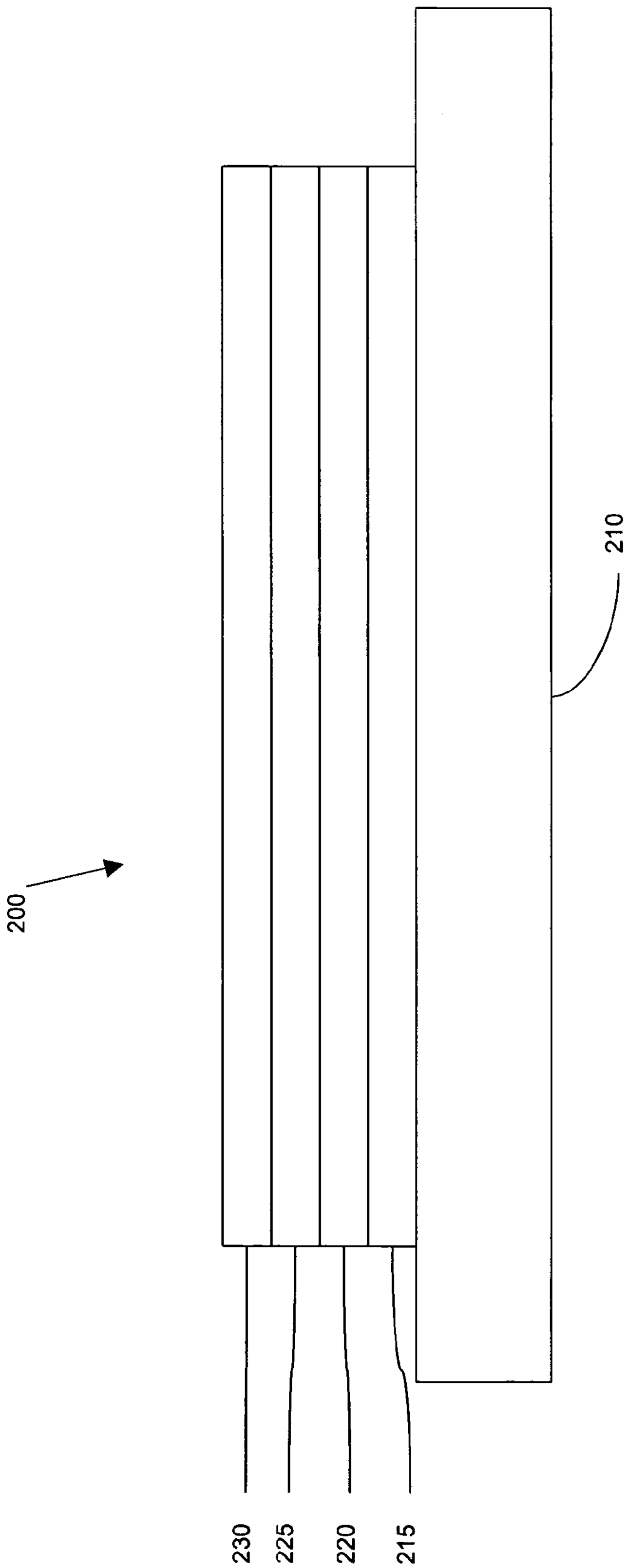


Figure 2

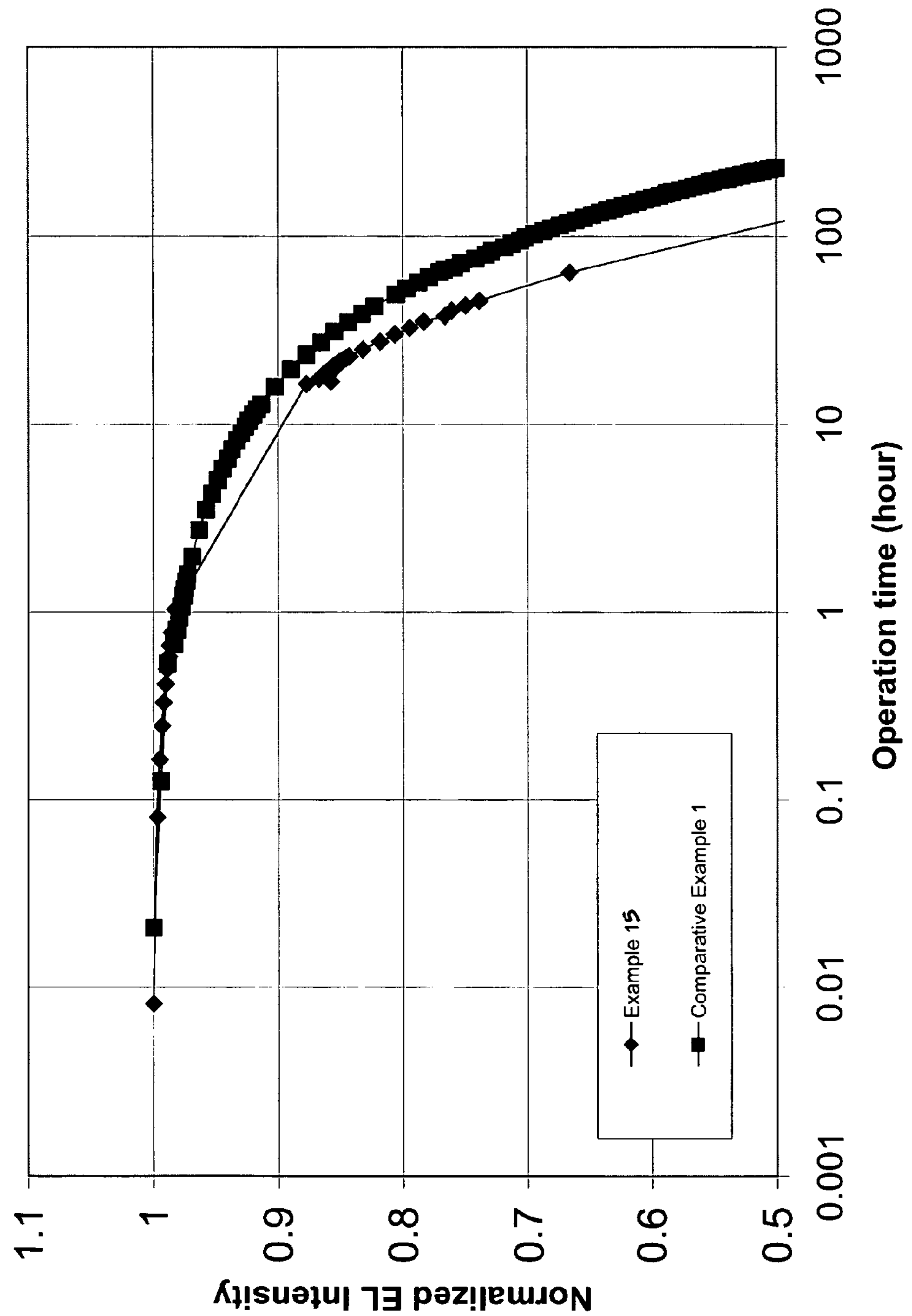

Normalized EL Intensity
1.1
1
0.9
0.8
0.7
0.6
0.5
0.001
0.01
0.1
1
10
100
1000
Operation time (hour)
Example 15
Comparative Example 1

Figure 29

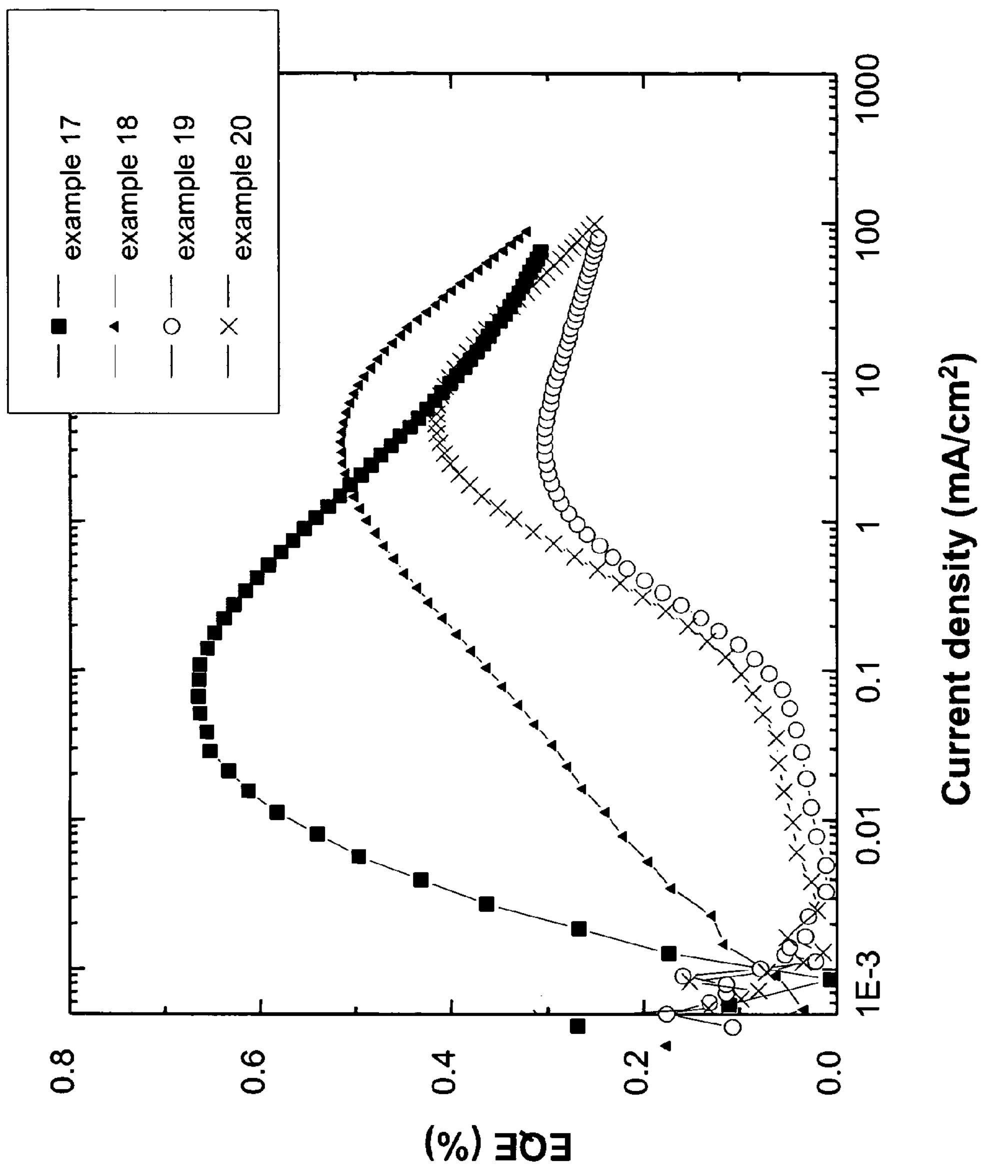

example 17
example 18
example 19
example 20
EQE (%)
0.0
0.2
0.4
0.6
0.8
1E-3
0.01
0.1
1
10
100
1000
Current density (mA/cm²)

Figure 30

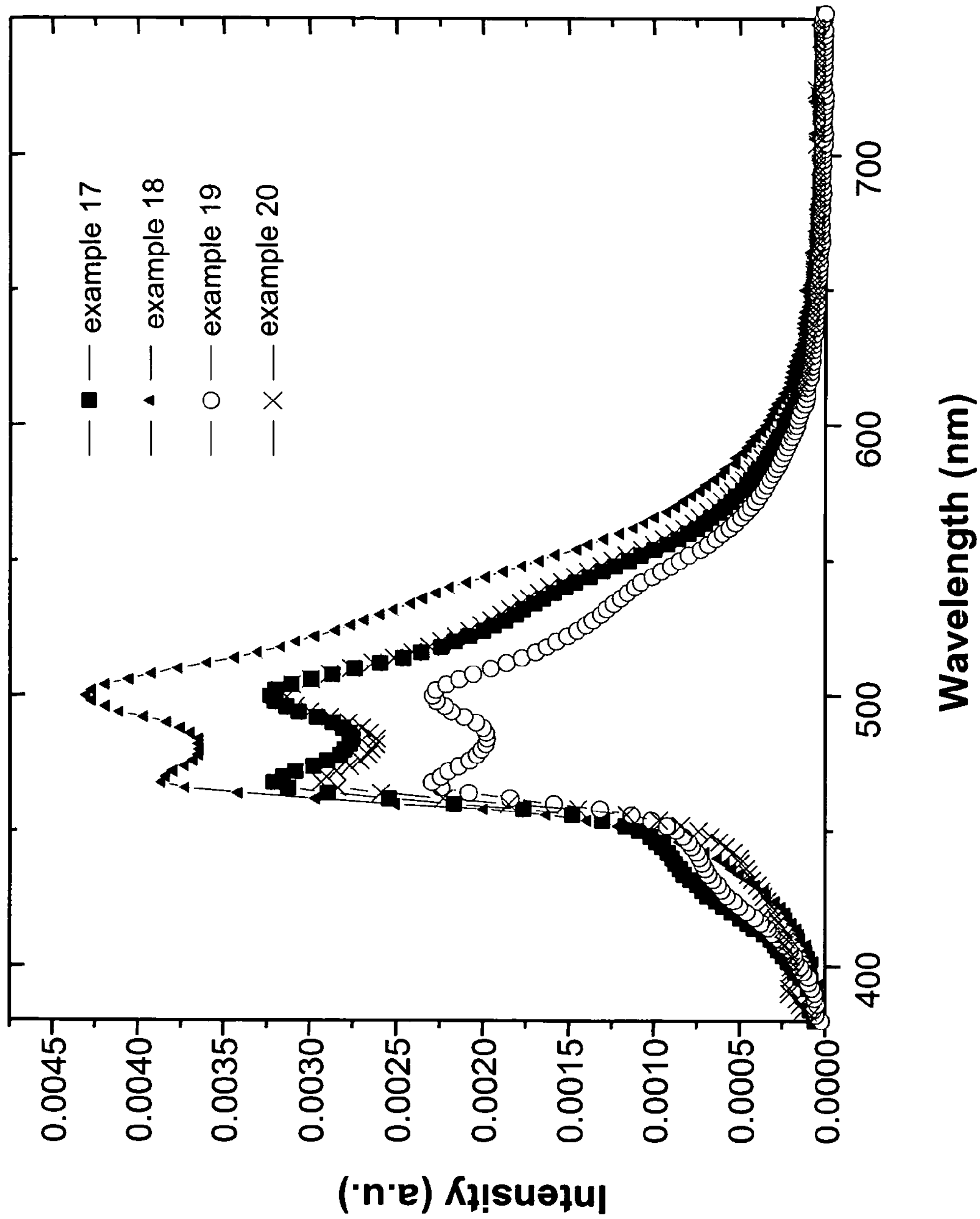

Intensity (a.u.)
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
0.0045
400
500
600
700
Wavelength (nm)
example 17
example 18
example 19
example 20

Figure 31

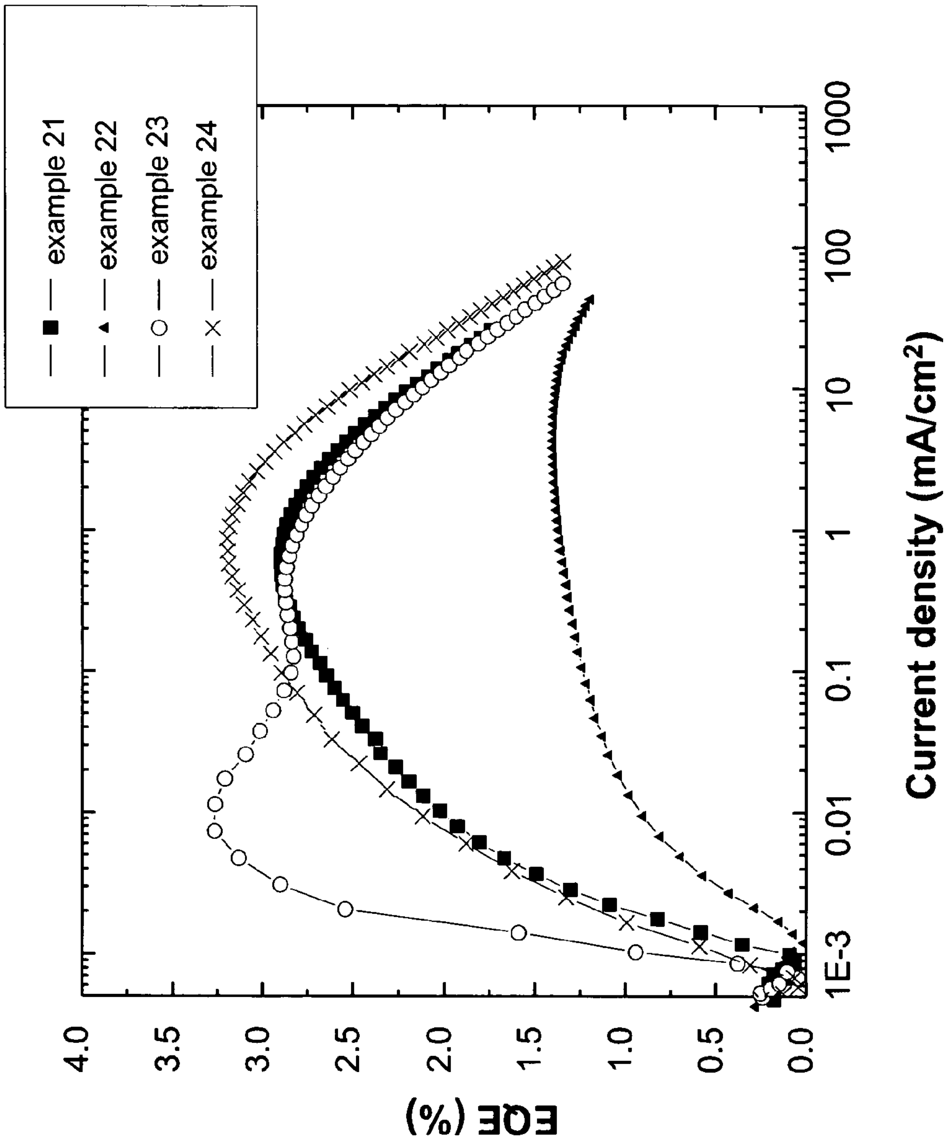
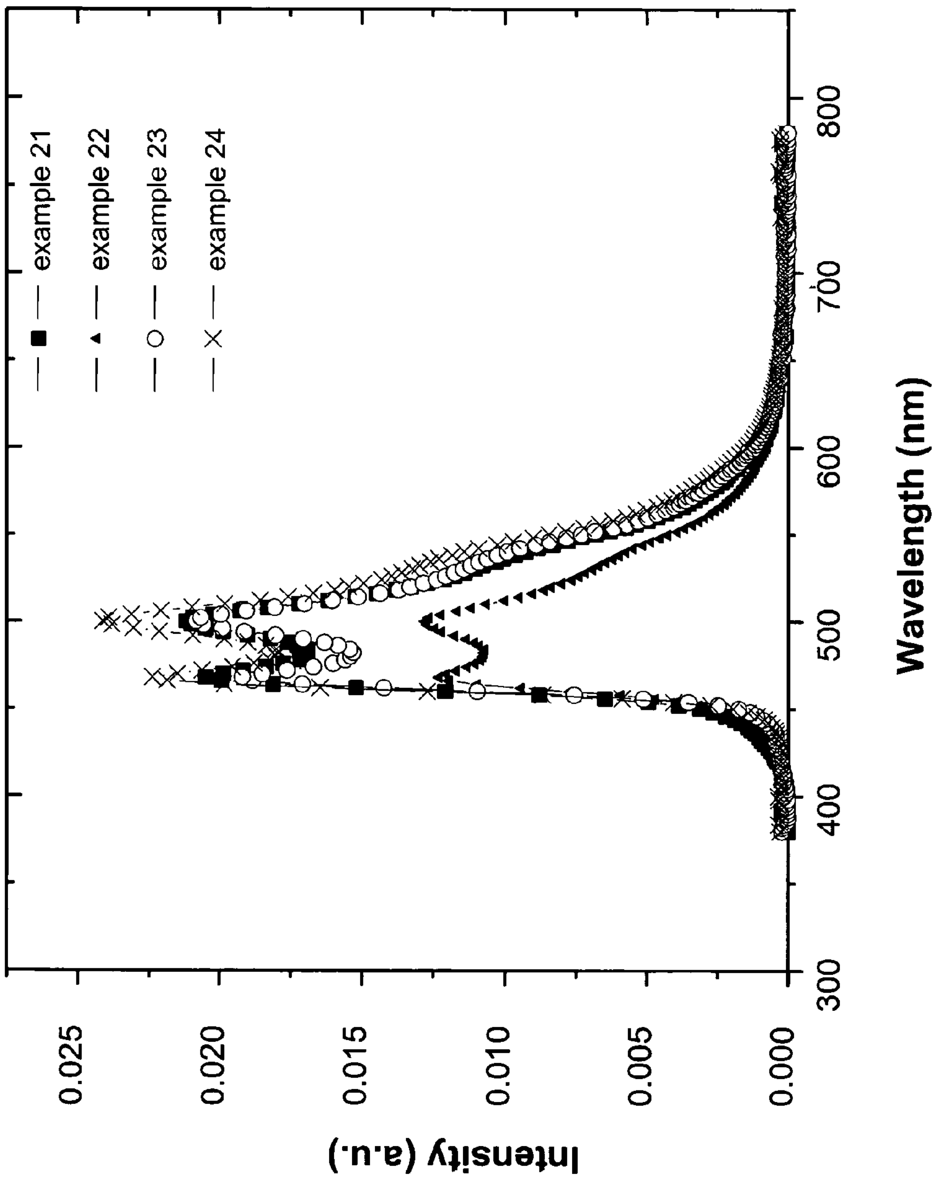
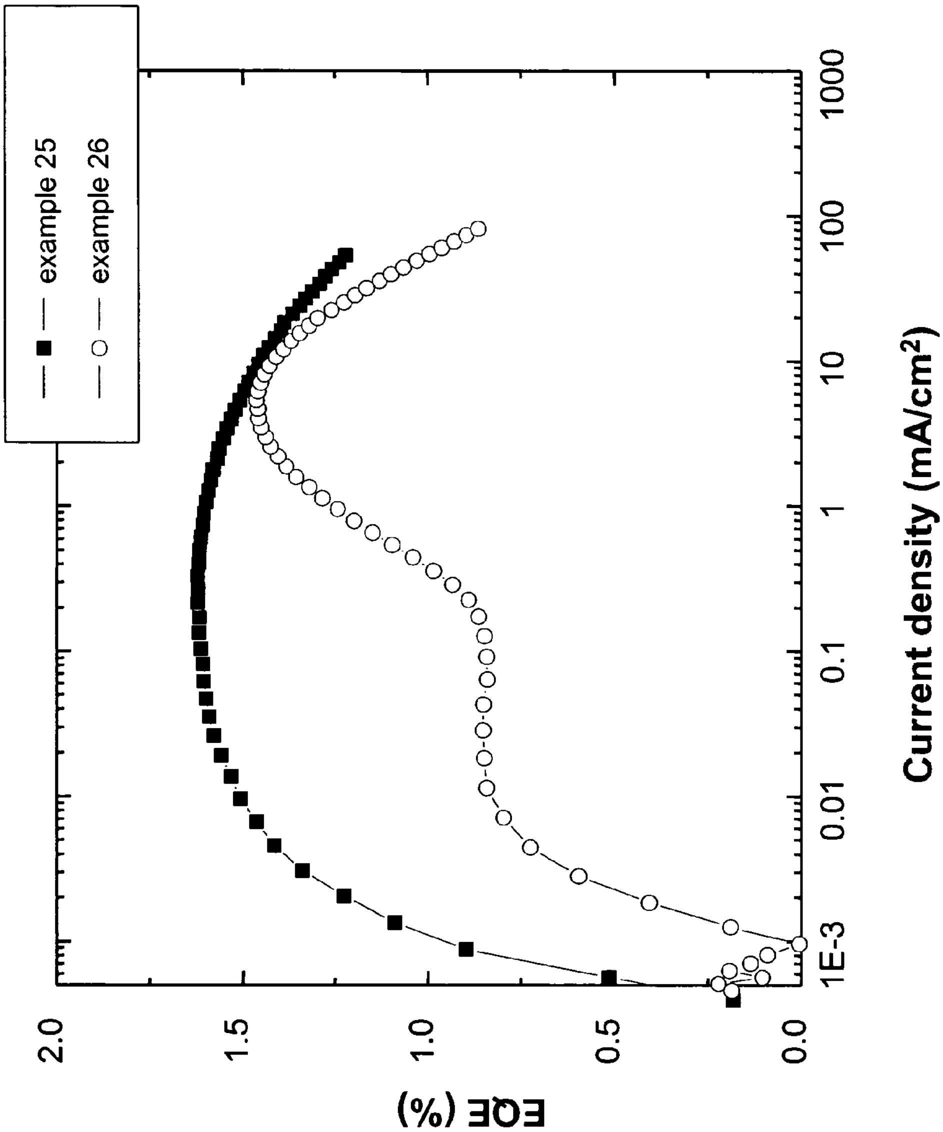

example 21
example 22
example 23
example 24
EQE (%)
Current density (mA/cm²)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1E-3
0.01
0.1
1
10
100
1000

Figure 32



example 21
example 22
example 23
example 24
Intensity (a.u.)
0.025
0.020
0.015
0.010
0.005
0.000
300
400
500
600
700
800
Wavelength (nm)

Figure 33



example 25
example 26
EQE (%)
2.0
1.5
1.0
0.5
0.0
1E-3
0.01
0.1
1
10
100
1000
Current density (mA/cm²)

Figure 34

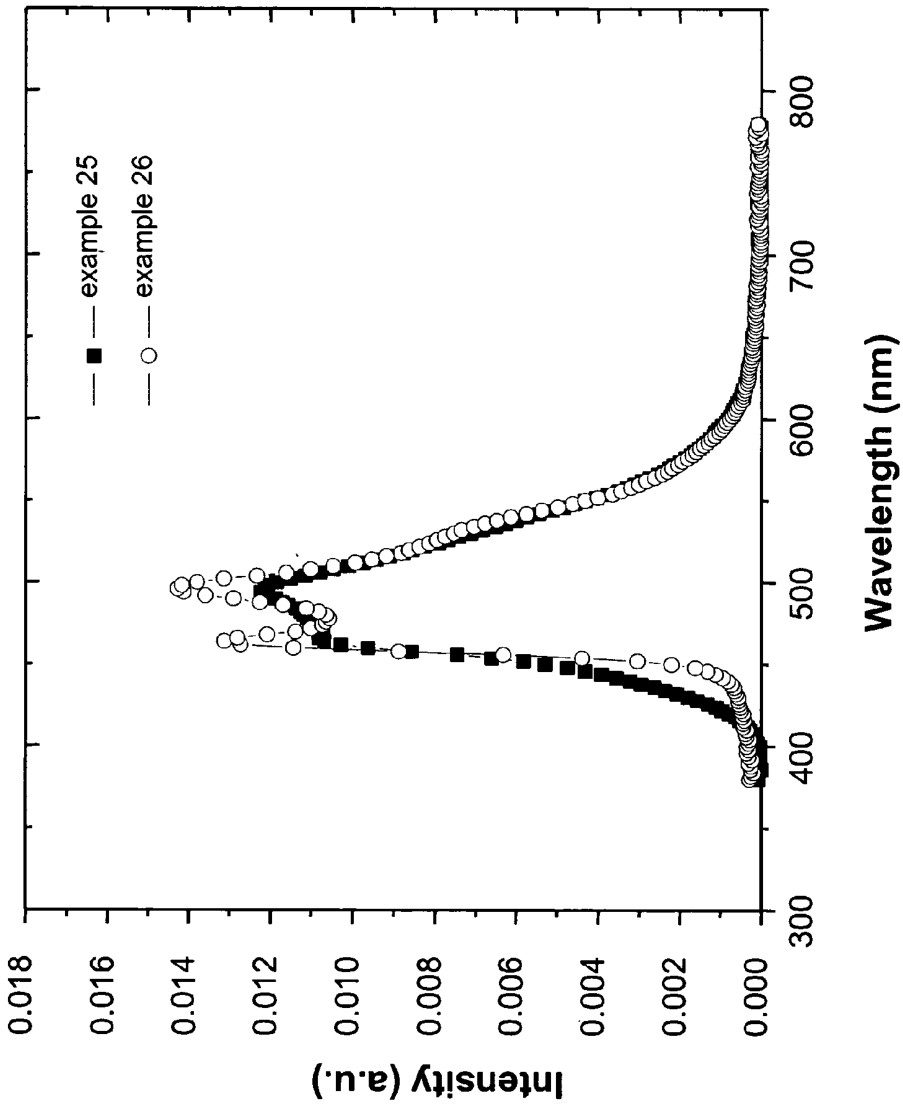

example 25
example 26
Intensity (a.u.)
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
300
400
500
600
700
800
Wavelength (nm)

Figure 35

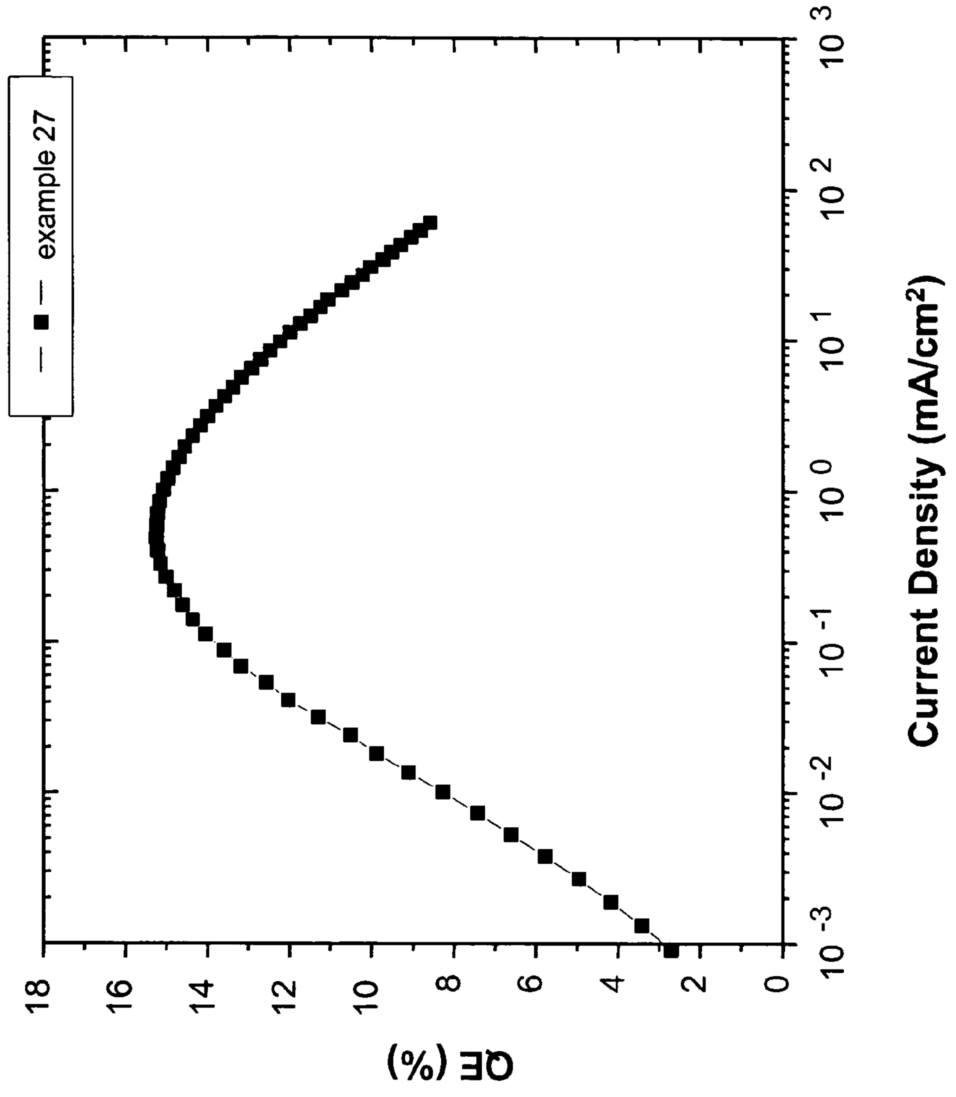

example 27
QE (%)
Current Density (mA/cm²)
0
2
4
6
8
10
12
14
16
18
10 -3
10 -2
10 -1
10 0
10 1
10 2
10 3

Figure 36

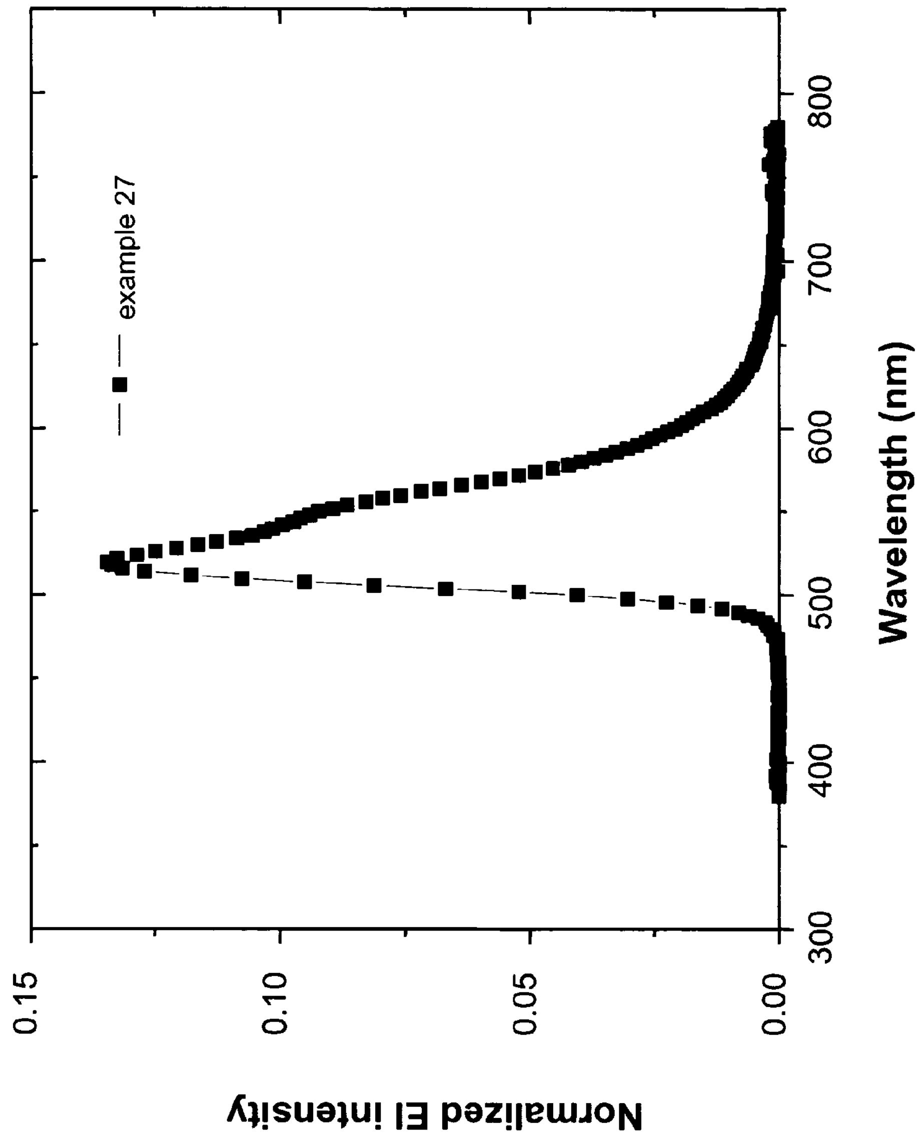

example 27
Normalized El intensity
0.15
0.10
0.05
0.00
300
400
500
600
700
800
Wavelength (nm)

Figure 37

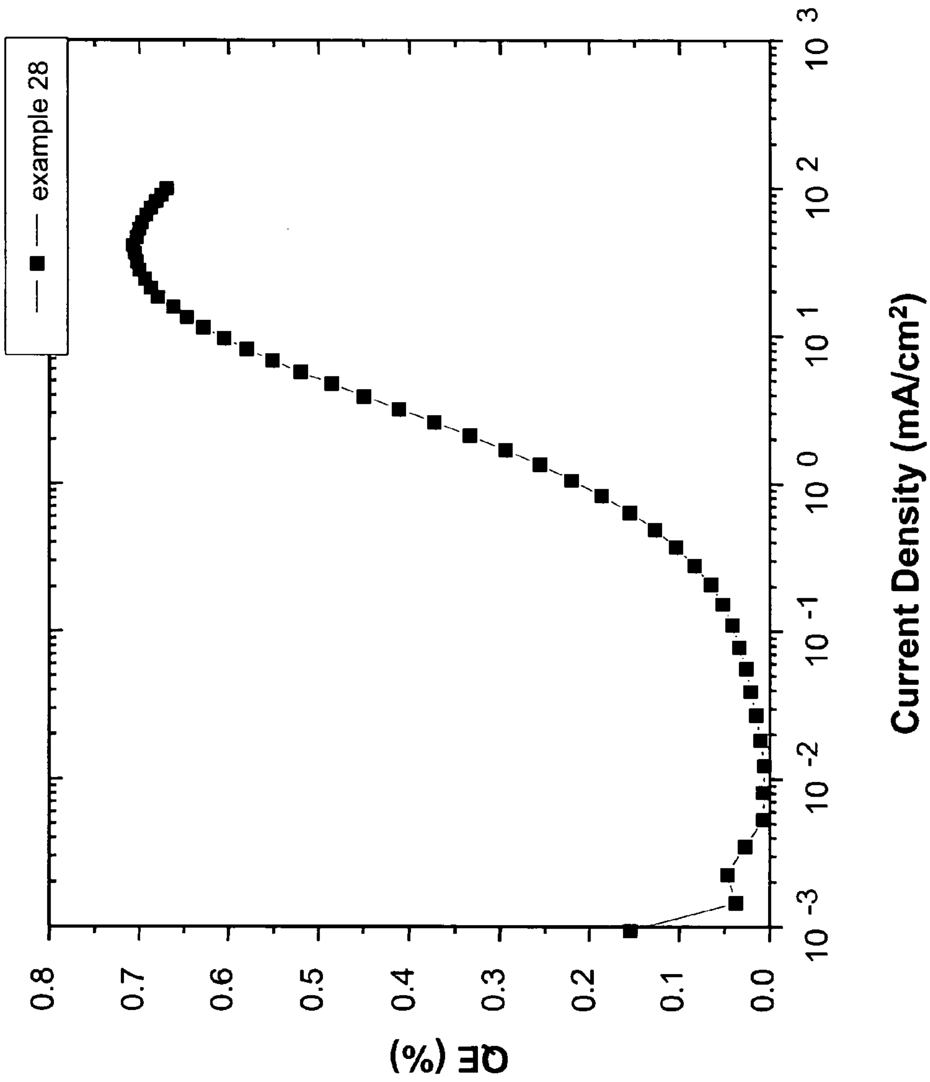

example 28
QE (%)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
10 -3
10 -2
10 -1
10 0
10 1
10 2
10 3
Current Density (mA/cm²)

Figure 38

^1H NMR of mer-$(F2ppz)_2Ir$(1-Ph-3-Me-imid) in $CDCl_3$

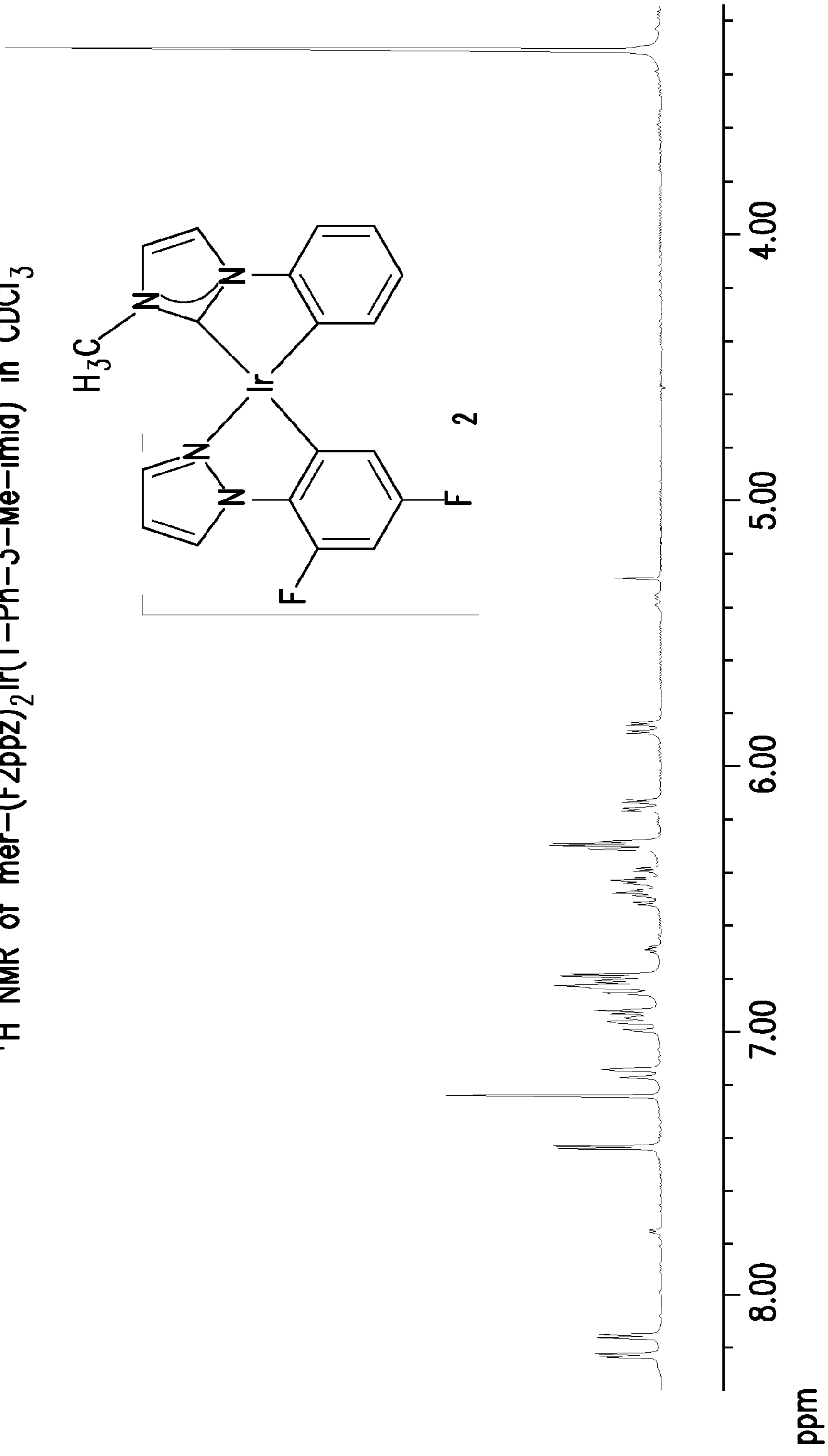
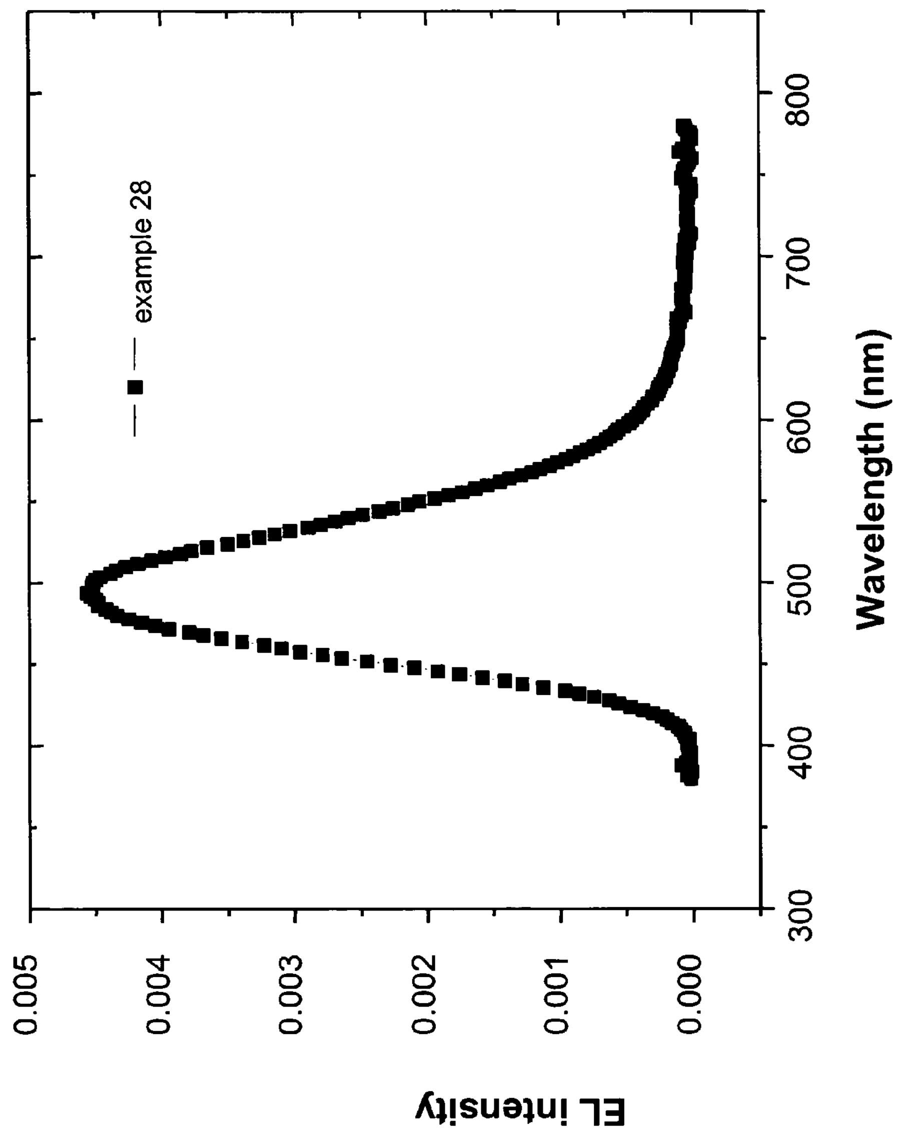


FIG. 3



EL intensity
0.005
0.004
0.003
0.002
0.001
0.000
300
400
500
600
700
800
Wavelength (nm)
example 28

Figure 39

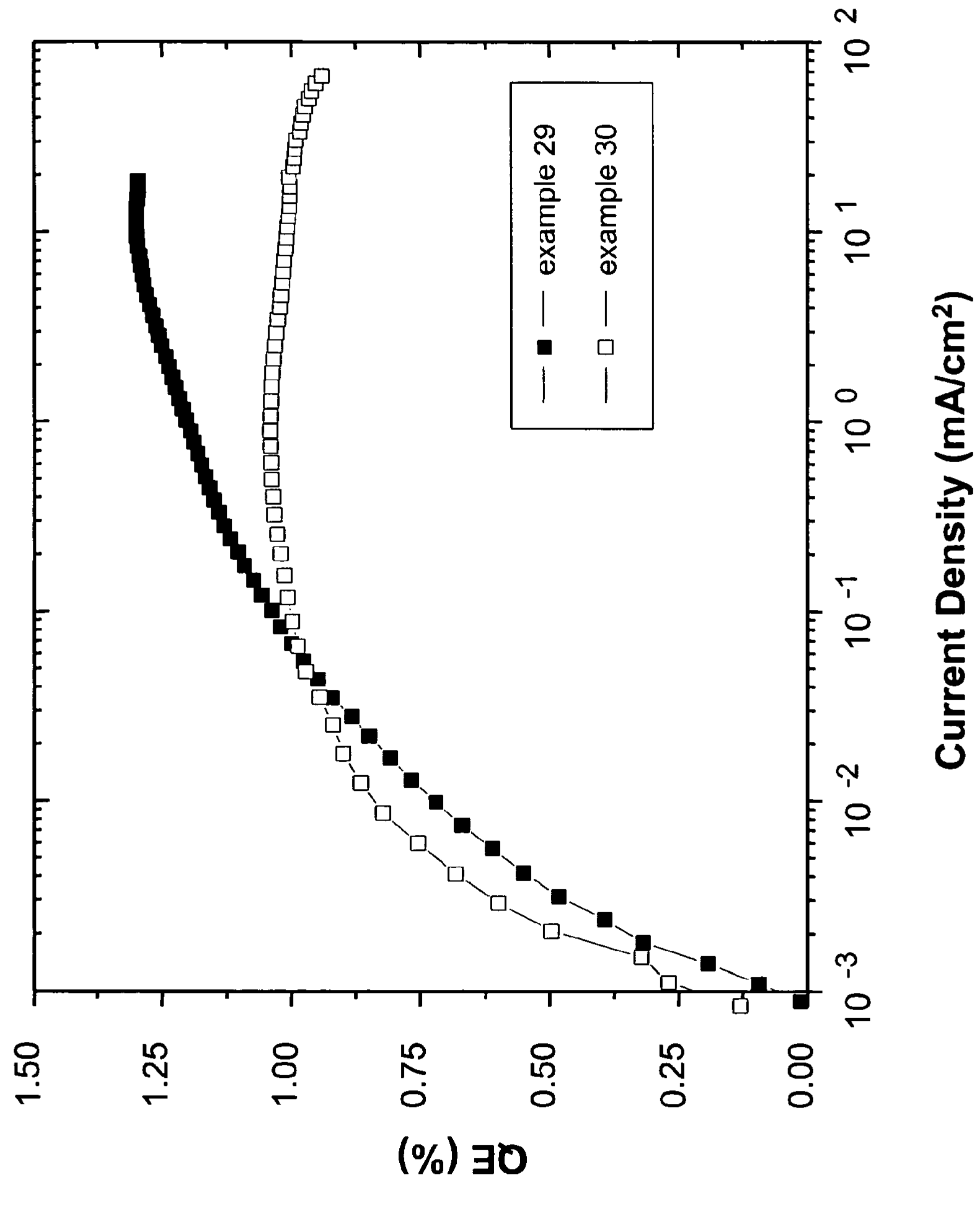

QE (%)
1.50
1.25
1.00
0.75
0.50
0.25
0.00
10 -3
10 -2
10 -1
10 0
10 1
10 2
Current Density (mA/cm2)
example 29
example 30

Figure 40

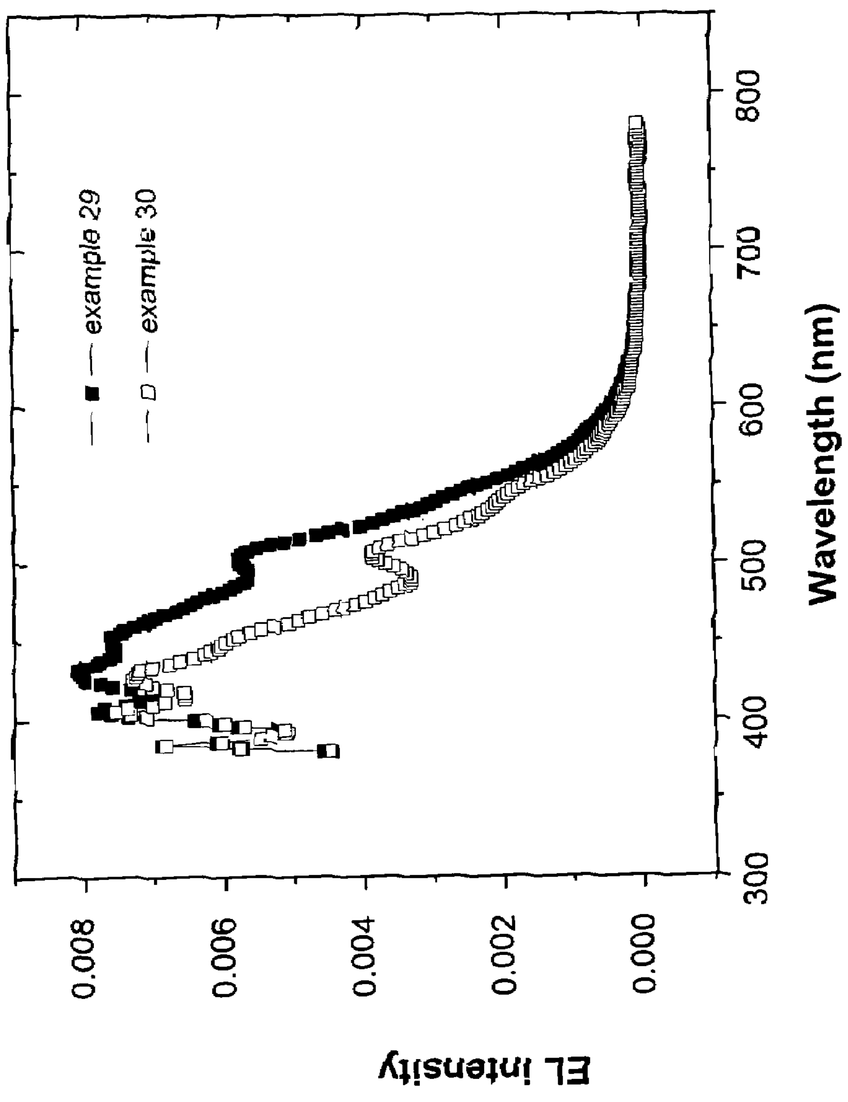

example 29
example 30
Wavelength (nm)
EL intensity
300
400
500
600
700
800
0.008
0.006
0.004
0.002
0.000

Figure 41

Example 28 EL spectra subtracted from EL spectra of example 29

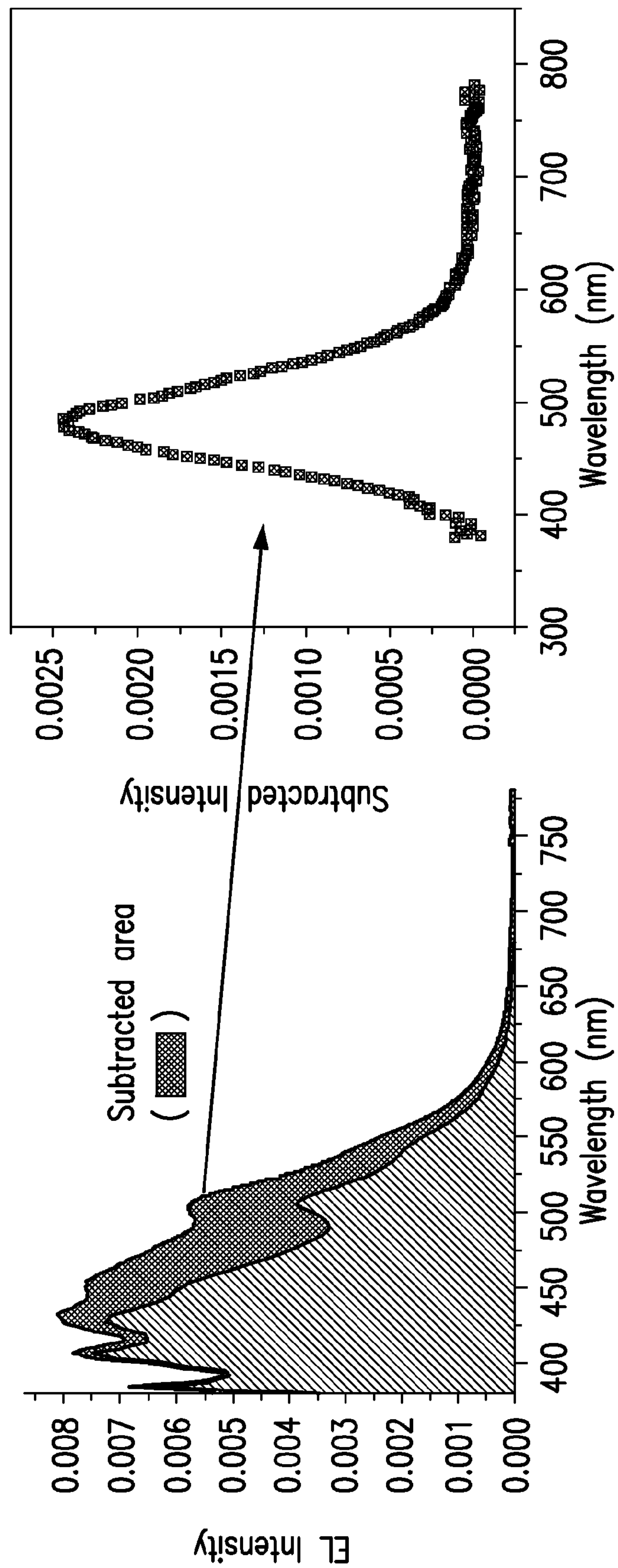


Figure 42

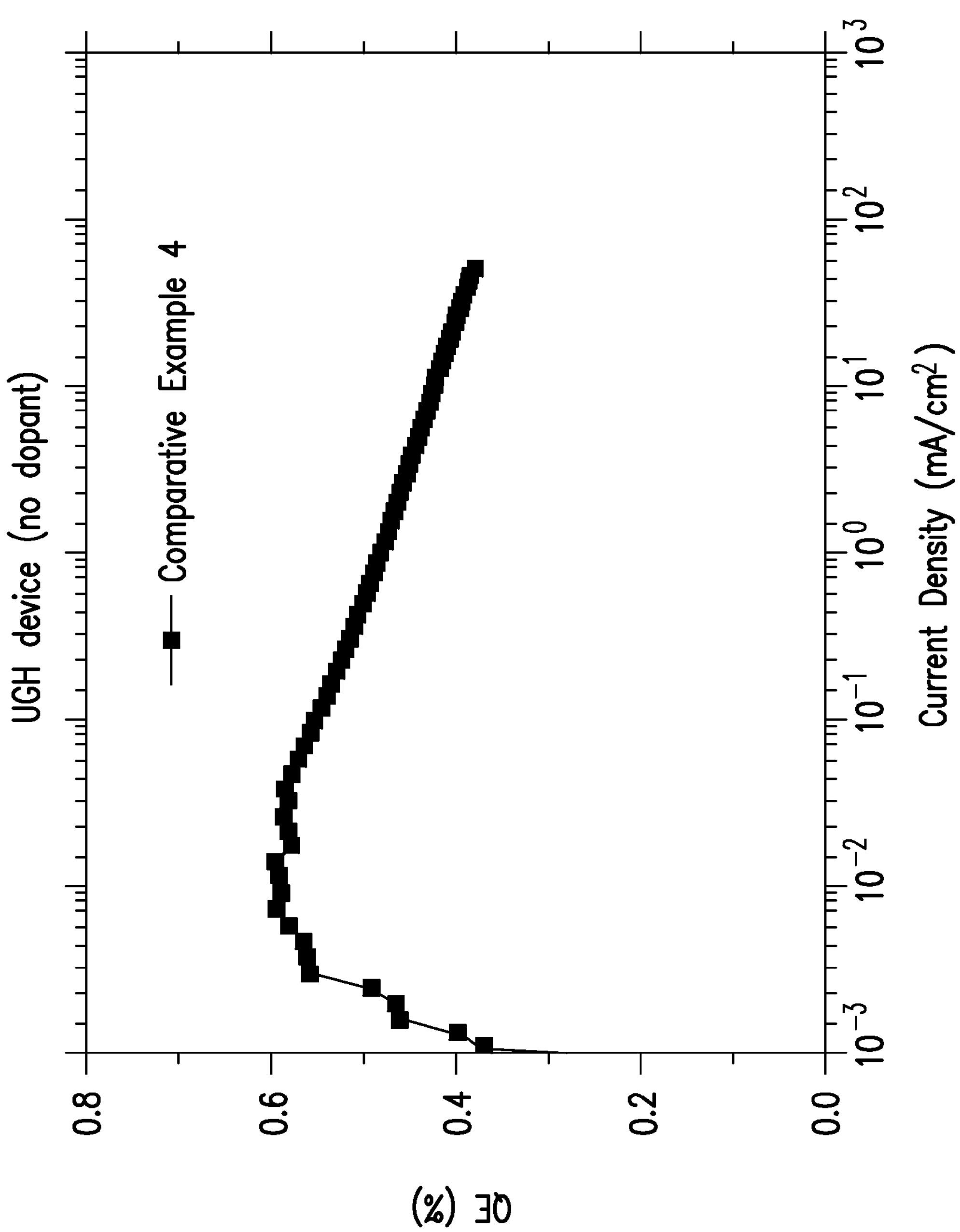

UGH device (no dopant)
Comparative Example 4
QE (%)
0.8
0.6
0.4
0.2
0.0
Current Density (mA/cm^2)
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}

FIG.43

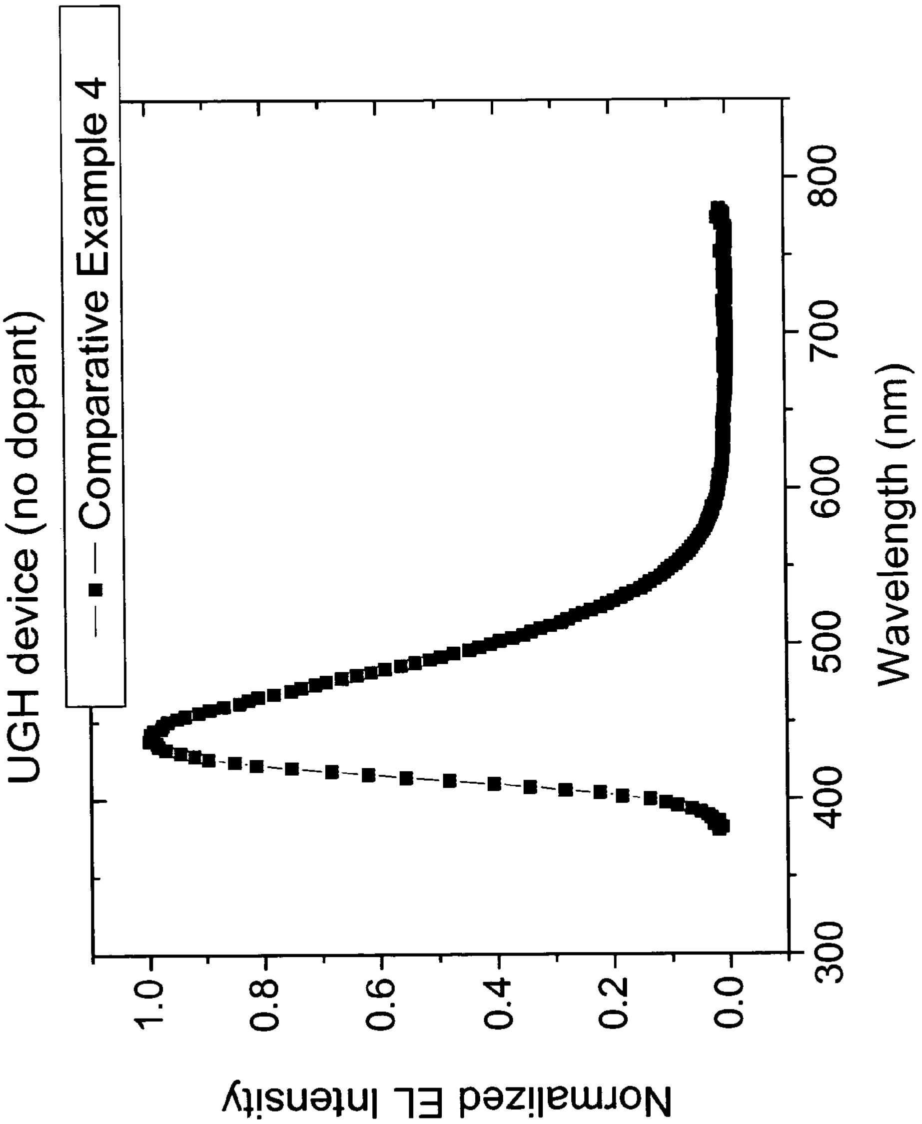

UGH device (no dopant)
Comparative Example 4
Normalized EL Intensity
0.0
0.2
0.4
0.6
0.8
1.0
300
400
500
600
700
800
Wavelength (nm)

Figure 44

LUMINESCENT COMPOUNDS WITH CARBENE LIGANDS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation of U.S. application Ser. No. 10/880,384, filed Jun. 28, 2004, now U.S. Pat. No. 7,393,599, which is a continuation-in-part of U.S. application Ser. No. 10/849,301, filed May 18, 2004, now U.S. Pat. No. 7,491,823, entitled Luminescent Compounds with Carbene Ligands, and which is incorporated by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to organic light emitting devices (OLEDs), and more specifically to phosphorescent organic materials used in such devices. More specifically, the present invention relates to carbene-metal complexes incorporated into OLEDs.

BACKGROUND

Opto-electronic devices that make use of organic materials are becoming increasingly desirable for a number of reasons. Many of the materials used to make such devices are relatively inexpensive, so organic opto-electronic devices have the potential for cost advantages over inorganic devices. In addition, the inherent properties of organic materials, such as their flexibility, may make them well suited for particular applications such as fabrication on a flexible substrate. Examples of organic opto-electronic devices include organic light emitting devices (OLEDs), organic phototransistors, organic photovoltaic cells, and organic photodetectors. For OLEDs, the organic materials may have performance advantages over conventional materials. For example, the wavelength at which an organic emissive layer emits light may generally be readily tuned with appropriate dopants.

As used herein, the term "organic" includes polymeric materials as well as small molecule organic materials that may be used to fabricate organic opto-electronic devices. "Small molecule" refers to any organic material that is not a polymer, and "small molecules" may actually be quite large. Small molecules may include repeat units in some circumstances. For example, using a long chain alkyl group as a substituent does not remove a molecule from the "small molecule" class. Small molecules may also be incorporated into polymers, for example as a pendent group on a polymer backbone or as a part of the backbone. Small molecules may also serve as the core moiety of a dendrimer, which consists of a series of chemical shells built on the core moiety. The core moiety of a dendrimer may be an fluorescent or phosphorescent small molecule emitter. A dendrimer may be a "small molecule," and it is believed that all dendrimers currently used in the field of OLEDs are small molecules.

OLEDs make use of thin organic films that emit light when voltage is applied across the device. OLEDs are becoming an increasingly interesting technology for use in applications such as flat panel displays, illumination, and backlighting. Several OLED materials and configurations are described in U.S. Pat. Nos. 5,844,363, 6,303,238, and 5,707,745, which are incorporated herein by reference in their entirety.

OLED devices are generally (but not always) intended to emit light through at least one of the electrodes, and one or more transparent electrodes may be useful in an organic opto-electronic devices. For example, a transparent electrode material, such as indium tin oxide (ITO), may be used as the bottom electrode. A transparent top electrode, such as disclosed in U.S. Pat. Nos. 5,703,436 and 5,707,745, which are incorporated by reference in their entireties, may also be used. For a device intended to emit light only through the bottom electrode, the top electrode does not need to be transparent, and may be comprised of a thick and reflective metal layer having a high electrical conductivity. Similarly, for a device intended to emit light only through the top electrode, the bottom electrode may be opaque and/or reflective. Where an electrode does not need to be transparent, using a thicker layer may provide better conductivity, and using a reflective electrode may increase the amount of light emitted through the other electrode, by reflecting light back towards the transparent electrode. Fully transparent devices may also be fabricated, where both electrodes are transparent. Side emitting OLEDs may also be fabricated, and one or both electrodes may be opaque or reflective in such devices.

As used herein, "top" means furthest away from the substrate, while "bottom" means closest to the substrate. For example, for a device having two electrodes, the bottom electrode is the electrode closest to the substrate, and is generally the first electrode fabricated. The bottom electrode has two surfaces, a bottom surface closest to the substrate, and a top surface further away from the substrate. Where a first layer is described as "disposed over" a second layer, the first layer is disposed further away from substrate. There may be other layers between the first and second layer, unless it is specified that the first layer is "in physical contact with" the second layer. For example, a cathode may be described as "disposed over" an anode, even though there are various organic layers in between.

As used herein, "solution processible" means capable of being dissolved, dispersed, or transported in and/or deposited from a liquid medium, either in solution or suspension form.

The carbene ligand has been well known in organometallic chemistry, and is used to generate a wide range of thermally stable catalytic materials. The carbene ligands have been employed both as active groups, directly engaged in the catalytic reactions, and serving a role of stabilizing the metal in a particular oxidation state or coordination geometry. However, applications of carbene ligands are not well known in photochemistry and have yet to be used as electroluminescent compounds.

One issue with many existing organic electroluminescent compounds is that they are not sufficiently stable for use in commercial devices. An object of the invention is to provide a class of organic emissive compounds having improved stability.

In addition, existing compounds do not include compounds that are stable emitters for high energy spectra, such as a blue spectra. An object of the invention is to provide a class of organic emissive compounds that can emit light with various spectra, including high energy spectra such as blue, in a stable manner.

SUMMARY OF THE INVENTION

An organic light emitting device is provided. The device has an anode, a cathode and an organic layer disposed between the anode and the cathode. The organic layer comprises a compound further comprising one or more carbene ligands coordinated to a metal center.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an organic light emitting device having separate electron transport, hole transport, and emissive layers, as well as other layers.

FIG. **2** shows an inverted organic light emitting device that does not have a separate electron transport layer.

FIG. **3** shows the ^{1}H NMR spectra of mer-$(F_2ppz)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$.

FIG. **4** shows the ^{1}H NMR spectra of mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$.

FIG. **5** shows the ^{1}H NMR spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) in $CDCl_3$.

FIG. **6** shows the plot of current (μA) vs. voltage (V) of a mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) device with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF_6^-$ is used.

FIG. **7** shows the plot of current (μA) vs. voltage (V) of a fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) device with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF6^-$ is used.

FIG. **8** shows the absorption spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) and mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in CH_2Cl_2.

FIG. **9** shows the emission spectra of mer-$(tpy)_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF at room temperature and at 77K. The compound exhibits lifetimes of 1.7 μs at room temperature and 3.3 μs at 77K.

FIG. **10** shows the emission spectra of fac-$(tpy)_2$Ir(1-Ph-3-Me-imid) in 2-MeTHF at room temperature and at 77K. The compound exhibits lifetimes of 1.7 μs at room temperature and 3.3 μs at 77K.

FIG. **11** shows the ^{1}H NMR spectra of $[(1\text{-Ph-3-Me-imid})_2IrCl]_2$ in $CDCl_3$.

FIG. **12** shows the ^{1}H NMR spectra of $(1\text{-Ph-3-Me-imid})_2Ir(t\text{-Bu-bpy})^+$ in $CDCl_3$.

FIG. **13** shows the absorption spectra of $(1\text{-Ph-3-Me-imid})_2Ir(t\text{-Bu-bpy})^+$ in CH_2Cl_2.

FIG. **14** shows the emission spectra of $(1\text{-Ph-3-Me-imid})_2Ir(t\text{-Bu-bpy})^+$ in 2-MeTHF at 77K and $(1\text{-Ph-3-Me-imid})_2Ir(t\text{-Bu-bpy})^+$ in CH_2Cl_2 at room temperature. The compound exhibits lifetimes of 0.70 μs at room temperature and 6.0 μs at 77K.

FIG. **15** shows the ^{1}H NMR spectra of mer-Ir$(1\text{-Ph-3-Me-imid})_3$ in $CDCl_3$.

FIG. **16** shows the ^{13}C NMR spectra of mer-Ir$(1\text{-Ph-3-Me-imid})_3$ in $CDCl_3$.

FIG. **17** shows the plot of current (μA) vs. voltage (V) of a mer-Ir$(1\text{-Ph-3-Me-imid})_3$ device with ferrocene as an internal reference. A solvent of DMF with 0.1M $Bu_4N^+PF_6^-$ is used.

FIG. **18** shows the emission spectra of mer-Ir$(1\text{-Ph-3-Me-imid})_3$ in 2-MeTHF at room temperature and at 77K.

FIG. **19** shows the ^{1}H NMR spectra of fac-Ir$(1\text{-Ph-3-Me-imid})_3$ in $CDCl_3$.

FIG. **20** shows the absorption spectra of fac-Ir$(1\text{-Ph-3-Me-imid})_3$ in CH_2Cl_2.

FIG. **21** shows the emission spectra of fac-Ir$(1\text{-Ph-3-Me-imid})_3$ in 2-MeTHF at room temperature and at 77K. The device exhibits lifetimes of 0.50 μs at room temperature and 6.8 μs at 77K.

FIG. **22** shows the ^{1}H NMR spectra of 1-Ph-3-Me-benzimid in $CDCl_3$.

FIG. **23** shows the ^{1}H NMR spectra of fac-Ir$(1\text{-Ph-3-Me-benzimid})_3$ in $CDCl_3$.

FIG. **24** shows the plot of current (mA) vs. voltage (V) of a fac-Ir$(1\text{-Ph-3-Me-benzimid})_3$ device with ferrocene as an internal reference. A solvent of anhydrous DMF is used.

FIG. **25** shows the emission spectra of fac-Ir$(1\text{-Ph-3-Me-benzimid})_3$ in 2-MeTHF at room temperature and at 77K. The device emits a spectrum at CIE 0.17, 0.04.

FIG. **26** shows the emission spectra of $(\text{Ir—Fl-Me-imid})_3$ in 2-MeTHF at room temperature and at 77K. The device exhibits lifetimes of 5 μs at room temperature and 35 μs at 77K.

FIG. **27** shows the external quantum efficiency vs. current density of examples 15-16 and comparative example 1.

FIG. **28** shows the electroluminescence spectra of examples 15-16 and comparative example 1 at 10 mA/cm^2.

FIG. **29** shows the operational stability of example 15 vs comparative example 1.

FIG. **30** shows the external quantum efficiency vs. current density of examples 17-20.

FIG. **31** shows the electroluminescence spectra of examples 17-20.

FIG. **32** shows the external quantum efficiency vs. current density of examples 21-24.

FIG. **33** shows the electroluminescence spectra of examples 21-24.

FIG. **34** shows the external quantum efficiency vs. current density of examples 25 and 26.

FIG. **35** shows the electroluminescence spectra of examples 25 and 26.

FIG. **36** shows the external quantum efficiency vs. current density of example 27.

FIG. **37** shows the electroluminescence spectra of example 27.

FIG. **38** shows the external quantum efficiency vs. current density of example 28.

FIG. **39** shows the electroluminescence spectra of example 28.

FIG. **40** shows the external quantum efficiency vs. current density of example 29 and 30.

FIG. **41** shows the electroluminescence spectra of example 29 and 30.

FIG. **42** shows the subtracted EL spectra of example 29 from example 30.

FIG. **43** shows the quantum efficiency vs. current density for comparative example 4.

FIG. **44** shows the normalized electroluminescent spectra for comparative example 4.

DETAILED DESCRIPTION

Generally, an OLED comprises at least one organic layer disposed between and electrically connected to an anode and a cathode. When a current is applied, the anode injects holes and the cathode injects electrons into the organic layer(s). The injected holes and electrons each migrate toward the oppositely charged electrode. When an electron and hole localize on the same molecule, an "exciton," which is a localized electron-hole pair having an excited energy state, is formed. Light is emitted when the exciton relaxes via a photoemissive mechanism. In some cases, the exciton may be localized on an excimer or an exciplex. Non-radiative mechanisms, such as thermal relaxation, may also occur, but are generally considered undesirable.

The initial OLEDs used emissive molecules that emitted light from their singlet states ("fluorescence") as disclosed, for example, in U.S. Pat. No. 4,769,292, which is incorporated by reference in its entirety. Fluorescent emission generally occurs in a time frame of less than 10 nanoseconds.

More recently, OLEDs having emissive materials that emit light from triplet states ("phosphorescence") have been demonstrated. Baldo et al., "Highly Efficient Phosphorescent Emission from Organic Electroluminescent Devices," Nature, vol. 395, 151-154, 1998; ("Baldo-I") and Baldo et al., "Very high-efficiency green organic light-emitting devices based on electrophosphorescence," Appl. Phys. Lett., vol. 75, No. 3, 4-6 (1999) ("Baldo-II"), which are incorporated by reference in their entireties. Phosphorescence may be referred to as a "forbidden" transition because the transition requires a change in spin states, and quantum mechanics indicates that such a transition is not favored. As a result, phosphorescence generally occurs in a time frame exceeding at least 10 nanoseconds, and typically greater than 100 nanoseconds. If the natural radiative lifetime of phosphorescence is too long, triplets may decay by a non-radiative mechanism, such that no light is emitted. Organic phosphorescence is also often observed in molecules containing heteroatoms with unshared pairs of electrons at very low temperatures. 2,2'-bipyridine is such a molecule. Non-radiative decay mechanisms are typically temperature dependent, such that a material that exhibits phosphorescence at liquid nitrogen temperatures may not exhibit phosphorescence at room temperature. But, as demonstrated by Baldo, this problem may be addressed by selecting phosphorescent compounds that do phosphoresce at room temperature. Representative emissive layers include doped or un-doped phosphorescent organometallic materials such as disclosed in U.S. Pat. Nos. 6,303,238 and 6,310,360; U.S. Patent Application Publication Nos. 2002-0034656; 2002-0182441; and 2003-0072964; and WO-02/074015.

Generally, the excitons in an OLED are believed to be created in a ratio of about 3:1, i.e., approximately 75% triplets and 25% singlets. See, Adachi et al., "Nearly 100% Internal Phosphorescent Efficiency In An Organic Light Emitting Device," J. Appl. Phys., 90, 5048 (2001), which is incorporated by reference in its entirety. In many cases, singlet excitons may readily transfer their energy to triplet excited states via "intersystem crossing," whereas triplet excitons may not readily transfer their energy to singlet excited states. As a result, 100% internal quantum efficiency is theoretically possible with phosphorescent OLEDs. In a fluorescent device, the energy of triplet excitons is generally lost to radiationless decay processes that heat-up the device, resulting in much lower internal quantum efficiencies. OLEDs utilizing phosphorescent materials that emit from triplet excited states are disclosed, for example, in U.S. Pat. No. 6,303,238, which is incorporated by reference in its entirety.

Phosphorescence may be preceded by a transition from a triplet excited state to an intermediate non-triplet state from which the emissive decay occurs. For example, organic molecules coordinated to lanthanide elements often phosphoresce from excited states localized on the lanthanide metal. However, such materials do not phosphoresce directly from a triplet excited state but instead emit from an atomic excited state centered on the lanthanide metal ion. The europium diketonate complexes illustrate one group of these types of species.

Phosphorescence from triplets can be enhanced over fluorescence by confining, preferably through bonding, the organic molecule in close proximity to an atom of high atomic number. This phenomenon, called the heavy atom effect, is created by a mechanism known as spin-orbit coupling. Such a phosphorescent transition may be observed from an excited metal-to-ligand charge transfer (MLCT) state of an organometallic molecule such as tris(2-phenylpyridine)iridium(III).

As used herein, the term "triplet energy" refers to an energy corresponding to the highest energy feature discernable in the phosphorescence spectrum of a given material. The highest energy feature is not necessarily the peak having the greatest intensity in the phosphorescence spectrum, and could, for example, be a local maximum of a clear shoulder on the high energy side of such a peak.

FIG. **1** shows an organic light emitting device **100**. The figures are not necessarily drawn to scale. Device **100** may include a substrate **110**, an anode **115**, a hole injection layer **120**, a hole transport layer **125**, an electron blocking layer **130**, an emissive layer **135**, a hole blocking layer **140**, an electron transport layer **145**, an electron injection layer **150**, a protective layer **155**, and a cathode **160**. Cathode **160** is a compound cathode having a first conductive layer **162** and a second conductive layer **164**. Device **100** may be fabricated by depositing the layers described, in order.

Substrate **110** may be any suitable substrate that provides desired structural properties. Substrate **110** may be flexible or rigid. Substrate **110** may be transparent, translucent or opaque. Plastic and glass are examples of preferred rigid substrate materials. Plastic and metal foils are examples of preferred flexible substrate materials. Substrate **110** may be a semiconductor material in order to facilitate the fabrication of circuitry. For example, substrate **110** may be a silicon wafer upon which circuits are fabricated, capable of controlling OLEDs subsequently deposited on the substrate. Other substrates may be used. The material and thickness of substrate **110** may be chosen to obtain desired structural and optical properties.

Anode **115** may be any suitable anode that is sufficiently conductive to transport holes to the organic layers. The material of anode **115** preferably has a work function higher than about 4 eV (a "high work function material"). Preferred anode materials include conductive metal oxides, such as indium tin oxide (ITO) and indium zinc oxide (IZO), aluminum zinc oxide (AlZnO), and metals. Anode **115** (and substrate **110**) may be sufficiently transparent to create a bottom-emitting device. A preferred transparent substrate and anode combination is commercially available ITO (anode) deposited on glass or plastic (substrate). A flexible and transparent substrate-anode combination is disclosed in U.S. Pat. Nos. 5,844,363 and 6,602,540 B2, which are incorporated by reference in their entirety. Anode **115** may be opaque and/or reflective. A reflective anode **115** may be preferred for some top-emitting devices, to increase the amount of light emitted from the top of the device. The material and thickness of anode **115** may be chosen to obtain desired conductive and optical properties. Where anode **115** is transparent, there may be a range of thickness for a particular material that is thick enough to provide the desired conductivity, yet thin enough to provide the desired degree of transparency. Other anode materials and structures may be used.

Hole transport layer **125** may include a material capable of transporting holes. Hole transport layer **130** may be intrinsic (undoped), or doped. Doping may be used to enhance conductivity. α-NPD and TPD are examples of intrinsic hole transport layers. An example of a p-doped hole transport layer is m-MTDATA doped with F_4-TCNQ at a molar ratio of 50:1, as disclosed in United States Patent Application Publication No. 2002-0071963 A1 to Forrest et al., which is incorporated by reference in its entirety. Other hole transport layers may be used.

Emissive layer **135** may include an organic material capable of emitting light when a current is passed between anode **115** and cathode **160**. Preferably, emissive layer **135** contains a phosphorescent emissive material, although fluorescent emissive materials may also be used. Phosphorescent materials are preferred because of the higher luminescent efficiencies associated with such materials. Emissive layer **135** may also comprise a host material capable of transporting electrons and/or holes, doped with an emissive material that may trap electrons, holes, and/or excitons, such that excitons relax from the emissive material via a photoemissive mechanism. Emissive layer **135** may comprise a single material that combines transport and emissive properties. Whether the emissive material is a dopant or a major constituent, emissive layer **135** may comprise other materials, such as dopants that tune the emission of the emissive material. Emissive layer **135** may include a plurality of emissive materials capable of, in combination, emitting a desired spectrum of light. Examples of phosphorescent emissive materials include $Ir(ppy)_3$. Examples of fluorescent emissive materials include DCM and DMQA. Examples of host materials include Alq_3, CBP and mCP. Examples of emissive and host materials are disclosed in U.S. Pat. No. 6,303,238 to Thompson et al., which is incorporated by reference in its entirety. Emissive material may be included in emissive layer **135** in a number of ways. For example, an emissive small molecule may be incorporated into a polymer. This may be accomplished by several ways: by doping the small molecule into the polymer either as a separate and distinct molecular species; or by incorporating the small molecule into the backbone of the polymer, so as to form a co-polymer; or by bonding the small molecule as a pendant group on the polymer. Other emissive layer materials and structures may be used. For example, a small molecule emissive material may be present as the core of a dendrimer.

Electron transport layer **140** may include a material capable of transporting electrons. Electron transport layer **140** may be intrinsic (undoped), or doped. Doping may be used to enhance conductivity. Alq_3 is an example of an intrinsic electron transport layer. An example of an n-doped electron transport layer is BPhen doped with Li at a molar ratio of 1:1, as disclosed in United States Patent Application Publication No. 2002-0071963 A1 to Forrest et al., which is incorporated by reference in its entirety. Other electron transport layers may be used.

The charge carrying component of the electron transport layer may be selected such that electrons can be efficiently injected from the cathode into the LUMO (Lowest Unoccupied Molecular Orbital) level of the electron transport layer. The "charge carrying component" is the material responsible for the LUMO that actually transports electrons. This component may be the base material, or it may be a dopant. The LUMO level of an organic material may be generally characterized by the electron affinity of that material and the relative electron injection efficiency of a cathode may be generally characterized in terms of the work function of the cathode material. This means that the preferred properties of an electron transport layer and the adjacent cathode may be specified in terms of the electron affinity of the charge carrying component of the ETL and the work function of the cathode material. In particular, so as to achieve high electron injection efficiency, the work function of the cathode material is preferably not greater than the electron affinity of the charge carrying component of the electron transport layer by more than about 0.75 eV, more preferably, by not more than about 0.5 eV. Similar considerations apply to any layer into which electrons are being injected.

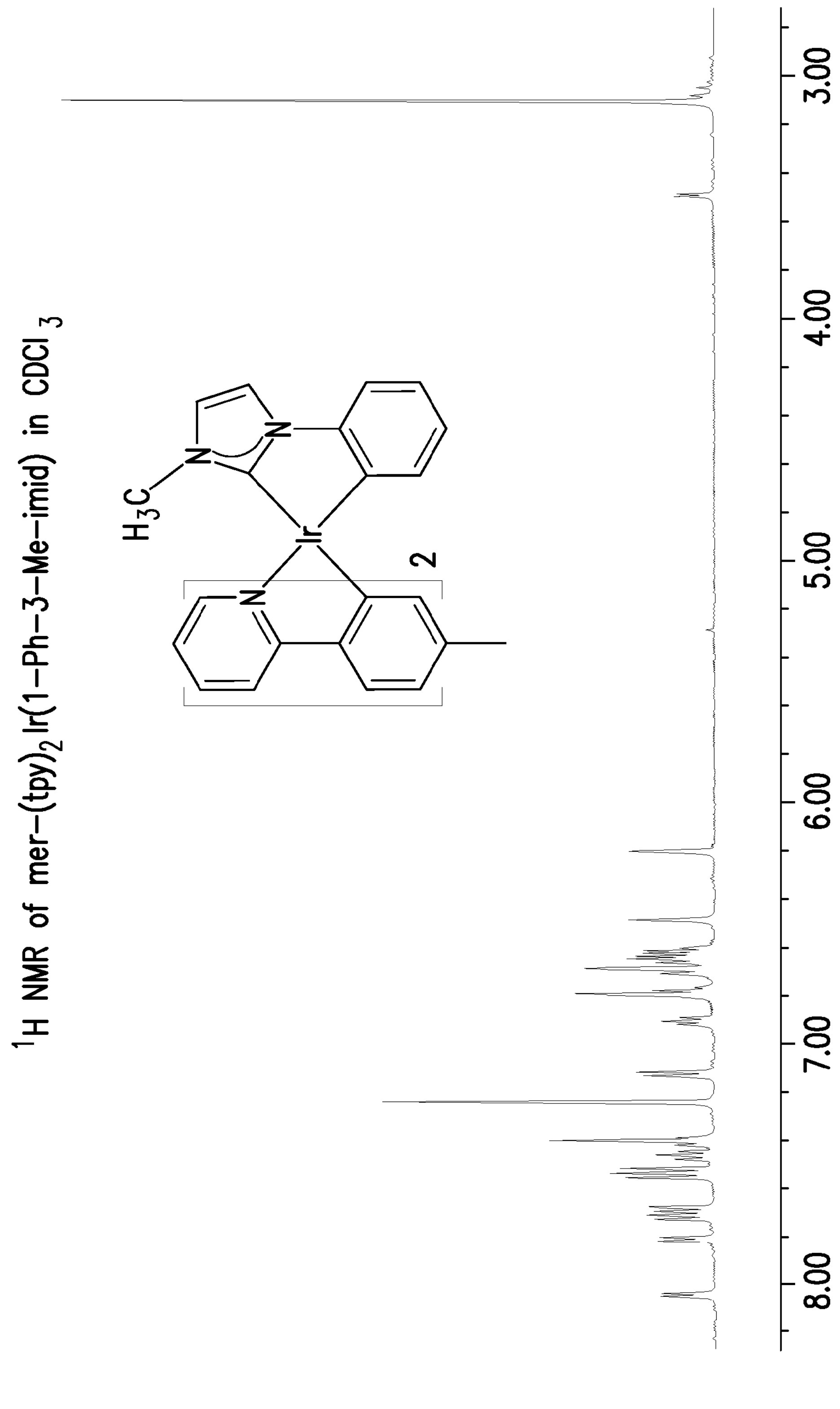
Cathode **160** may be any suitable material or combination of materials known to the art, such that cathode **160** is capable of conducting electrons and injecting them into the organic layers of device **100**. Cathode **160** may be transparent or opaque, and may be reflective. Metals and metal oxides are examples of suitable cathode materials. Cathode **160** may be a single layer, or may have a compound structure. FIG. **1** shows a compound cathode **160** having a thin metal layer **162** and a thicker conductive metal oxide layer **164**. In a compound cathode, preferred materials for the thicker layer **164** include ITO, IZO, and other materials known to the art. U.S. Pat. Nos. 5,703,436, 5,707,745, 6,548,956 B2, and 6,576,134 B2, which are incorporated by reference in their entireties, disclose examples of cathodes including compound cathodes having a thin layer of metal such as Mg:Ag with an overlying transparent, electrically-conductive, sputter-deposited ITO layer. The part of cathode **160** that is in contact with the underlying organic layer, whether it is a single layer cathode **160**, the thin metal layer **162** of a compound cathode, or some other part, is preferably made of a material having a work function lower than about 4 eV (a "low work function material"). Other cathode materials and structures may be used.

Blocking layers may be used to reduce the number of charge carriers (electrons or holes) and/or excitons that leave the emissive layer. An electron blocking layer **130** may be disposed between emissive layer **135** and the hole transport layer **125**, to block electrons from leaving emissive layer **135** in the direction of hole transport layer **125**. Similarly, a hole blocking layer **140** may be disposed between emissive layer **135** and electron transport layer **145**, to block holes from leaving emissive layer **135** in the direction of electron transport layer **140**. Blocking layers may also be used to block excitons from diffusing out of the emissive layer. The theory and use of blocking layers is described in more detail in U.S. Pat. No. 6,097,147 and United States Patent Application Publication No. 2002-0071963 A1 to Forrest et al., which are incorporated by reference in their entireties.

As used herein, the term "blocking layer" means that the layer provides a barrier that significantly inhibits transport of charge carriers and/or excitons through the device, without suggesting that the layer necessarily completely blocks the charge carriers and/or excitons. The presence of such a blocking layer in a device may result in substantially higher efficiencies as compared to a similar device lacking a blocking layer. Also, a blocking layer may be used to confine emission to a desired region of an OLED.

Generally, injection layers are comprised of a material that may improve the injection of charge carriers from one layer, such as an electrode or an organic layer, into an adjacent organic layer. Injection layers may also perform a charge transport function. In device **100**, hole injection layer **120** may be any layer that improves the injection of holes from anode **115** into hole transport layer **125**. CuPc is an example of a material that may be used as a hole injection layer from an ITO anode **115**, and other anodes. In device **100**, electron injection layer **150** may be any layer that improves the injection of electrons into electron transport layer **145**. LiF/Al is an example of a material that may be used as an electron injection layer into an electron transport layer from an adjacent layer. Other materials or combinations of materials may be used for injection layers. Depending upon the configuration of a particular device, injection layers may be disposed at locations different than those shown in device **100**. More examples of injection layers are provided in U.S. patent application Ser. No. 09/931,948 to Lu et al., now U.S. Pat. No. 7,071,615, which is incorporated by reference in its entirety. A hole injection layer may comprise a solution deposited material, such as a spin-coated polymer, e.g., PEDOT:PSS, or it may be a vapor deposited small molecule material, e.g., CuPc or MTDATA.

A hole injection layer (HIL) may planarize or wet the anode surface so as to provide efficient hole injection from the anode into the hole injecting material. A hole injection layer may also have a charge carrying component having HOMO (Highest Occupied Molecular Orbital) energy levels that favorably match up, as defined by their herein-described relative ionization potential (IP) energies, with the adjacent anode layer on one side of the HIL and the hole transporting layer on the opposite side of the HIL. The "charge carrying compo-



1H NMR of mer-(tpy)2Ir(1-Ph-3-Me-imid) in CDCl3
H3C
N
N
Ir
N
2
3.00
4.00
5.00
6.00
7.00
8.00
ppm

FIG.4

nent" is the material responsible for the HOMO that actually transports holes. This component may be the base material of the HIL, or it may be a dopant. Using a doped HIL allows the dopant to be selected for its electrical properties, and the host to be selected for morphological properties such as wetting, flexibility, toughness, etc. Preferred properties for the HIL material are such that holes can be efficiently injected from the anode into the HIL material. In particular, the charge carrying component of the HIL preferably has an IP not more than about 0.7 eV greater that the IP of the anode material. More preferably, the charge carrying component has an IP not more than about 0.5 eV greater than the anode material. Similar considerations apply to any layer into which holes are being injected. HIL materials are further distinguished from conventional hole transporting materials that are typically used in the hole transporting layer of an OLED in that such HIL materials may have a hole conductivity that is substantially less than the hole conductivity of conventional hole transporting materials. The thickness of the HIL of the present invention may be thick enough to help planarize or wet the surface of the anode layer. For example, an HIL thickness of as little as 10 nm may be acceptable for a very smooth anode surface. However, since anode surfaces tend to be very rough, a thickness for the HIL of up to 50 nm may be desired in some cases.

A protective layer may be used to protect underlying layers during subsequent fabrication processes. For example, the processes used to fabricate metal or metal oxide top electrodes may damage organic layers, and a protective layer may be used to reduce or eliminate such damage. In device **100**, protective layer **155** may reduce damage to underlying organic layers during the fabrication of cathode **160**. Preferably, a protective layer has a high carrier mobility for the type of carrier that it transports (electrons in device **100**), such that it does not significantly increase the operating voltage of device **100**. CuPc, BCP, and various metal phthalocyanines are examples of materials that may be used in protective layers. Other materials or combinations of materials may be used. The thickness of protective layer **155** is preferably thick enough that there is little or no damage to underlying layers due to fabrication processes that occur after organic protective layer **160** is deposited, yet not so thick as to significantly increase the operating voltage of device **100**. Protective layer **155** may be doped to increase its conductivity. For example, a CuPc or BCP protective layer **160** may be doped with Li. A more detailed description of protective layers may be found in U.S. patent application Ser. No. 09/931,948 to Lu et al., now U.S. Pat. No. 7,071,615, which is incorporated by reference in its entirety.

FIG. **2** shows an inverted OLED **200**. The device includes a substrate **210**, an cathode **215**, an emissive layer **220**, a hole transport layer **225**, and an anode **230**. Device **200** may be fabricated by depositing the layers described, in order. Because the most common OLED configuration has a cathode disposed over the anode, and device **200** has cathode **215** disposed under anode **230**, device **200** may be referred to as an "inverted" OLED. Materials similar to those described with respect to device **100** may be used in the corresponding layers of device **200**. FIG. **2** provides one example of how some layers may be omitted from the structure of device **100**.

The simple layered structure illustrated in FIGS. **1** and **2** is provided by way of non-limiting example, and it is understood that embodiments of the invention may be used in connection with a wide variety of other structures. The specific materials and structures described are exemplary in nature, and other materials and structures may be used. Functional OLEDs may be achieved by combining the various layers described in different ways, or layers may be omitted entirely, based on design, performance, and cost factors. Other layers not specifically described may also be included. Materials other than those specifically described may be used. Although many of the examples provided herein describe various layers as comprising a single material, it is understood that combinations of materials, such as a mixture of host and dopant, or more generally a mixture, may be used. Also, the layers may have various sublayers. The names given to the various layers herein are not intended to be strictly limiting. For example, in device **200**, hole transport layer **225** transports holes and injects holes into emissive layer **220**, and may be described as a hole transport layer or a hole injection layer. In one embodiment, an OLED may be described as having an "organic layer" disposed between a cathode and an anode. This organic layer may comprise a single layer, or may further comprise multiple layers of different organic materials as described, for example, with respect to FIGS. **1** and **2**.

Structures and materials not specifically described may also be used, such as OLEDs comprised of polymeric materials (PLEDs) such as disclosed in U.S. Pat. No. 5,247,190, Friend et al., which is incorporated by reference in its entirety. By way of further example, OLEDs having a single organic layer may be used. OLEDs may be stacked, for example as described in U.S. Pat. No. 5,707,745 to Forrest et al, which is incorporated by reference in its entirety. The OLED structure may deviate from the simple layered structure illustrated in FIGS. **1** and **2**. For example, the substrate may include an angled reflective surface to improve out-coupling, such as a mesa structure as described in U.S. Pat. No. 6,091,195 to Forrest et al., and/or a pit structure as described in U.S. Pat. No. 5,834,893 to Bulovic et al., which are incorporated by reference in their entireties.

Unless otherwise specified, any of the layers of the various embodiments may be deposited by any suitable method. For the organic layers, preferred methods include thermal evaporation, ink-jet, such as described in U.S. Pat. Nos. 6,013,982 and 6,087,196, which are incorporated by reference in their entireties, organic vapor phase deposition (OVPD), such as described in U.S. Pat. No. 6,337,102 to Forrest et al., which is incorporated by reference in its entirety, and deposition by organic vapor jet printing (OVJP), such as described in U.S. patent application Ser. No. 10/233,470, now U.S. Pat. No. 7,431,968, which is incorporated by reference in its entirety. Other suitable deposition methods include spin coating and other solution based processes. Solution based processes are preferably carried out in nitrogen or an inert atmosphere. For the other layers, preferred methods include thermal evaporation. Preferred patterning methods include deposition through a mask, cold welding such as described in U.S. Pat. Nos. 6,294,398 and 6,468,819, which are incorporated by reference in their entireties, and patterning associated with some of the deposition methods such as ink-jet and OVJD. Other methods may also be used. The materials to be deposited may be modified to make them compatible with a particular deposition method. For example, substituents such as alkyl and aryl groups, branched or unbranched, and preferably containing at least 3 carbons, may be used in small molecules to enhance their ability to undergo solution processing. Substituents having 20 carbons or more may be used, and 3-20 carbons is a preferred range. Materials with asymmetric structures may have better solution processibility than those having symmetric structures, because asymmetric materials may have a lower tendency to recrystallize. Dendrimer substituents may be used to enhance the ability of small molecules to undergo solution processing.

Devices fabricated in accordance with embodiments of the invention may be incorporated into a wide variety of consumer products, including flat panel displays, computer monitors, televisions, billboards, lights for interior or exterior illumination and/or signaling, heads up displays, fully transparent displays, flexible displays, laser printers, telephones, cell phones, personal digital assistants (PDAs), laptop computers, digital cameras, camcorders, viewfinders, micro-displays, vehicles, a large area wall, theater or stadium screen, or a sign. Various control mechanisms may be used to control devices fabricated in accordance with the present invention, including passive matrix and active matrix. Many of the devices are intended for use in a temperature range comfortable to humans, such as 18 degrees C. to 30 degrees C., and more preferably at room temperature (20-25 degrees C.).

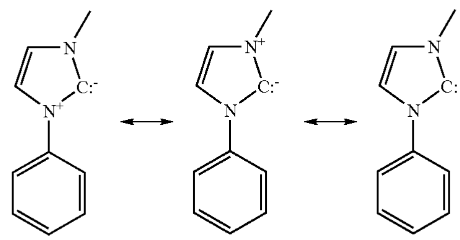
The materials and structures described herein may have applications in devices other than OLEDs. For example, other optoelectronic devices such as organic solar cells and organic photodetectors may employ the materials and structures. More generally, organic devices, such as organic transistors, may employ the materials and structures.

A compound comprising a carbene ligand bound to a metal center is provided. Carbene compounds include small molecules, dendrimers, and polymers that include a carbene-metal bond. In one embodiment, the compound is a phosphorescent emissive material, preferably a dopant. The compound may also be doped into a wide band gap host material such as disclosed in U.S. patent application Ser. No. 10/680,066 (now abandoned; Pub. No. US 2004/0209116 A1), which is incorporated by reference in its entirety, or it may be doped into an inert wide band gap host such as disclosed in WO-074015, which is incorporated by reference in its entirety.

In another embodiment, the metal-carbene compound is a host material in an emissive layer. For example, the metal-carbene compound may be used as a high energy host materials for doped blue devices. The dopant in this case could be a triplet emitter or a singlet emitter (using phosphor sensitized fluorescence). In some embodiments, the dopant is a blue or UV emissive material. In this case, the host material preferably has a wide energy gap. As used herein, the energy gap refers to the difference in the energy between the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) for a particular compound. The triplet energy for a given material is related to, but less than, the energy gap. Materials for use as a wide gap host are selected to have a wide energy gap so that the host material does not quench the dopant emission by endothermic or exothermic energy transfer. The wide gap host is preferably selected so as to have a triplet energy at least about 300 mV higher than that of the dopant.

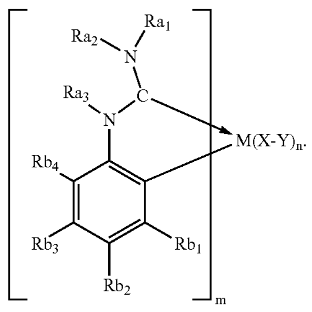
Additionally, the high band gap of metal-carbene compounds may make these materials effective in carrier blocking and transporting layers. Specifically, these materials may be used in the electron blocking layer, hole blocking layer, exciton blocking layer, hole transport layer, or electron transport layer of an OLED. In other embodiments a metal-carbene compound may be used as a hole injection layer, electron injection layer, or protective layer. It is believed that metal-carbene compounds described herein have improved thermal stability when incorporated into an organic light emitting device due to the carbene-metal bond, as compared to existing compounds without a carbene-metal bond.

As used herein, the term "carbene" refers to compounds having a divalent carbon atom with only six electrons in its valence shell when not coordinated to a metal. A useful exercise to determine whether a ligand includes a carbene-metal bond is to mentally deconstruct the complex as a metal fragment and a ligand, and to then determine whether a carbon atom in the ligand that was previously bound to the metal is a neutral divalent carbon atom in the deconstructed state. The resonance forms of a preferred embodiment may be shown as:



This definition of carbene is not limited to metal-carbene complexes synthesized from carbenes, but is rather intended to address the orbital structure and electron distribution associated with the carbon atom that is bound to the metal. The definition recognizes that the "carbene" may not technically be divalent when bound to the metal, but it would be divalent if it were detached from the metal. Although many such compounds are synthesized by first synthesizing a carbene and then binding it to a metal, the definition is intended to encompass compounds synthesized by other methods that have a similar orbital structure and electron configuration. Lowry & Richardson, *Mechanism and Theory in Organic Chemistry* 256 (Harper & Row, 1976) defines "carbene" in a way that is consistent with the way the term is used herein. Some references may define "carbene" as a carbon ligand that forms a double bond to a metal. While this definition is not being used in the present application, there may be some overlap between the two definitions. A variety of representations are used to depict the bonding in such carbenes, including those in which a curved line is used to indicate partial multiple bonding between the carbene carbon and the adjacent heteroatom(s).

In the figures and structures herein, a carbene-metal bond may be depicted as C→M, as for example:



Such structures that use an arrow to represent the presence of a metal-carbene bond are used interchangeably herein with structures that don't include the arrow, without any intention of suggesting there is a difference in the structure shown.

The term "organometallic" as used herein is as generally understood by one of ordinary skill in the art and as given, for example, in "Inorganic Chemistry" (2nd Edition) by Gary L. Miessler and Donald A. Tarr, Prentice-Hall (1998). Thus, the term organometallic refers to compounds which have an organic group bonded to a metal through a carbon-metal bond. This class does not include per se coordination compounds, which are substances having only donor bonds from heteroatoms, such as metal complexes of amines, halides, pseudohalides (CN, etc.), and the like. In practice organometallic compounds generally comprise, in addition to one or more carbon-metal bonds to an organic species, one or more donor bonds from a heteroatom. The carbon-metal bond to an organic species refers to a direct bond between a metal and a carbon atom of an organic group, such as phenyl, alkyl, alkenyl, etc., but does not refer to a metal bond to an "inorganic carbon," such as the carbon of CN.

Carbene ligands are especially desirable in OLED applications due to the high thermal stability exhibited by metal-carbene complexes. It is believed that the carbene, which behaves much as an electron donative group, generally bonds strongly to the metals, thus forming a more thermally stable complex than, for example, previous cyclometallated complexes used as phosphorescent emitters. It is also believed that carbene analogs of ligands employed in existing phosphorescent emissive materials (for example the phenylpyridine or Irppy, etc.) may exhibit greater stability and emit at substantially higher energy than their existing analogs.

As used herein, a "non-carbene analog" of a metal carbene compound refers to existing ligands having a substantially similar chemical structure to the metal-carbene compound, but unlike the carbene compounds of the present invention, which features a carbene-metal bond, the analog has some other bond, such as a carbon-metal or a nitrogen-metal bond, in place of the carbene-metal bond. For example, $Ir(ppz)_3$ has a nitrogen in each ligand bound to the Ir. Ir(1-phenylimidazolin-2-ylidene) is analogous to $Ir(ppz)_3$ where the nitrogen bound to the Ir has been replaced with a carbene bound to the Ir, and where the atoms surrounding the carbene have been changed to make the carbon a carbene. Thus, embodiments of the present invention include metal-carbene complexes (e.g. Ir(1-phenylimidazolin-2-ylidene) with similar structures to existing emissive compounds (e.g. $Ir(ppz)_3$).

Examples of existing emissive compounds include $Ir(ppy)_3$ and $Ir(ppz)_3$, discussed above. Other examples are disclosed in the references below, which are incorporated herein by reference in their entirety. In preferred embodiments, the carbene ligands are imidazoles, pyrazoles, benzimidazoles, and pyrroles.

It is believed that the carbene-metal bond in $Ir(1\text{-Ph-3-Me-imid})_3$ is stronger than the N-metal bond in $Ir(ppz)_3$. Moreover, due to the nature of a carbene-metal bond, it is believed that replacing a carbon-metal bond or nitrogen-metal bond in existing emissive organometallic molecules with a carbene-metal bond (making other changes as needed to make the carbon atom a carbene) may result in an emissive molecule that is more stable than the non-carbene analog, and that has stronger spin-orbit coupling. It is further believed that the emissive spectra of the molecule including a carbene may be different from the emissive spectra of the analog without a carbene.

Metal-carbene complexes may be tuned to emit a wide variety of spectra from the near-ultraviolet across the entire visible spectra by the selection of substituents and/or chemical groups on the ligand(s). More significantly, it may now be possible to obtain saturated blue color emissions with peak wavelengths at about 450 nm. Because it is believed to be materially easier to reduce than to increase the triplet energy by tuning an emissive compound, the ability to make stable blue emitters at such high energies would also allow for the possibility of obtaining any color by reducing the energy so as to red-shift the emission. For example, FIG. **18** shows that $Ir(1\text{-Ph-3-Me-imid})_3$, which is a preferred embodiment of this invention, in a 2-MeTHF solution emits in the near-UV spectra at a wavelength of about 380 nm at 77 K and at room temperature. The substitution of a fluorenyl group for the phenyl group attached to the methylimidazole results in a red-shift in the emission as shown in FIG. **26**. Thus, FIG. **26** shows $Ir\text{—}(FlMeImid)_3$, which is another embodiment of this invention, to emit at the visible part of the spectra at a wavelength of 462 nm at 77 K and at 466 nm at room temperature.

The appropriate selection of substituents and/or chemical groups attached to carbene ligands may also minimize quantum efficiency losses associated with increasing temperatures. The observable difference in lifetime measurements between emission at room temperature and at low temperatures (e.g. 77 K) is believed to be attributed to non-radiative quenching mechanisms that compete with phosphorescent emission. Such quenching mechanisms are further believed to be thermally activated, and consequently, at cooler temperatures of about 77 K, where energy loss due to quenching is not an issue, quantum efficiency is about 100%. For example, FIG. **21** shows the emission spectra of fac-$Ir(1\text{-Ph-3-Me-imid})_3$ in 2-MeTHF. The compound exhibits a lifetime of 6.8 μs at 77 K and 0.50 is at room temperature, and the difference may be attributed to quenching mechanisms. It is believed that appropriate substituents on the carbene ligand, or doping in a more rigid matrix, such as disclosed in Turro, "Modern Molecular Photochemistry", University Science Books (1991), 109-10, may increase quantum efficiency at room temperature and correspondingly show longer lifetimes.

Due to the nature of the carbene-metal bond, the emission of a carbene analog may be substantially different from that of its non-carbene analog, and the emission of the carbene analog may be stable and at a higher energy than previously obtainable with stable non-carbene compounds. Embodiments of the present invention shown in FIGS. **18**, **21**, **25**, and **26**, show higher energy emissions than have previously been obtained with other phosphorescent organometallic emissive materials. It is believed that devices incorporating these materials, and having optimized architecture, will have electroluminescent spectras showing high triplet energies similar to the photoluminescent spectras shown in these figures.

In some embodiments, the triplet energy of the carbene complex has a corresponding wavelength in the deep blue or ultraviolet (UV) part of the spectra. In some embodiments, the phosphorescent emissive compound has triplet energy corresponding to a wavelength of less than 450 nm. In preferred embodiments, the triplet energy corresponds to a wavelength of less than 440 nm, and in even more preferred embodiments, it corresponds to a wavelength less than 400 nm, which is believed to be in the UV region of the spectrum, since 400 nm is believed to represent the cut-off between the UV and the visible regions of the spectrum. Such high triplet energy may make these compounds useful in optically pumping down converting layers. For such applications, an overlap is preferred between the emission spectra of the ultraviolet carbene compound and the absorption spectra of the down converting layer. It is believed that when about 50% of the integral of the curve for the normalized electroluminescent spectra of the device is at a wavelength less than about 450 nm, there is sufficient energy to optically pump a down converting layer. More preferably, greater than 90% of the emission may be produced below 440 nm, as disclosed herein. Preferably, 50% of the integral of the curve for the normalized electroluminescent spectra is less than about 440 nm, and more preferably, it is less than about 400 nm. The wavelength cutoffs mentioned above are not intended to be absolute limitations as they depend on the energy of the material to be pumped. It is also believed that these emissions may occur at room temperature.

The strong metal-carbon bond is also believed to lead to greater spin-orbit coupling in metal carbene complexes. Moreover, the triplet energy of coordinated carbenes are shown to be significantly higher than pyridine analogs. FIG. **18** shows the emission spectra of mer-Ir(1-Ph-3-Me-imid)$_3$, which is one of the embodiments of the invention. The emission is shown to be in the near-ultraviolet range of the spectrum even at room temperature. It is believed herein that other metal carbene complexes may be capable of emitting at similarly high energies due to the strong metal-ligand bond associated with carbene ligands. The stability of metal-carbene complexes may also allow increased versatility in the types of ligands and metals that may be used as phosphorescent emitters in OLEDs. The strong metal-carbene bond may allow a variety of metals to form useful phosphorescent complexes with carbene ligands to give novel emissive compounds. For example, one embodiment includes gold or copper bonded to a carbene ligand. Such metals have been calculated to form metal-carbon bonds having quite high bond dissociation energies, such as illustrated in Nemcsok et al., "*The Significance of* π*-Interactions in Group* 11 *Complexes with N-Heterocyclic Carbenes,*" 2004 American Chemical Society, Publ, on Web, Jun. 19, 2004. Such high bond dissociation energies may be expected to improve the chemical stability of metal-carbene complexes as compared with the analogous metal-phenyl-pyridine ("metal-ppy") based complexes that are typically used in an OLED. Thus, in addition to their use as the emissive materials in an OLED, metal-carbene complexes may be also used advantageously, because of their improved chemical stability, for other functions in an OLED, for example, as a host material in the emissive layer, as an electron or hole transporting material in an electron or hole transporting layer, and/or as an electron or hole blocking material in an electron or hole blocking layer.

Additionally, although cyclometallated complexes are preferred embodiments, the present invention is not limited to such embodiments. The increased strength of a metal-carbene bond, as compared to other types of bonds with metal, may make monodentate ligands feasible for use as emissive materials. Until recently, bidentate ligands were strongly preferred due to stability concerns. Thus, embodiments include monodentate carbene ligands as well as bidentate. Embodiments also include tridentate carbene ligands, which may be quite stable, and many examples are found in the art, such as those disclosed in Koizumi et al., *Organometallics* 2003, 22, 970-975. Other embodiments may also feature a tetradentate ligand, such as porphyrin analogs in which one or more nitrogens are replaced by a carbene, which is disclosed in Bourissou et al. *Chem. Rev.* 2000, 100, 39-91. Still other embodiments may include metallaquinone carbenes, which are compounds in which one of the oxygen atoms of a quinone has been replaced by a metal, such as those disclosed in Ashekenazi et al., *J. Am. Chem. Soc.* 2000, 122, 8797-8798. In addition, The metal-carbene compound may be present as part of a multi-dentate group such as disclosed in U.S. patent application Ser. No. 10/771,423 to Ma et al. (now abandoned; Pub. No. US 2005/0170206 A1), which is incorporated by reference in its entirety.

It is believed that many of the (C,C) or (C,N) ligands of many existing electroluminescent compounds may be modified to create an analogous (C,C) ligand including a carbene. Specific non limiting examples of such modification include:

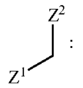
(1) the substituents on the carbene-bonded branch of the (C,C)-ligand and the substituents on the mono-anionic-carbon-bonded branch of the (C,C)-ligand may be independently selected from the group consisting of
   (a) the substituents on the N-bonded branch of the existing (C,N)-ligands, such as disclosed in the references listed below, which is typically but not necessarily a pyridine group; and
   (b) the substituents on the mono-anionic-carbon-bonded branch of the existing (C,N)-ligands, such as disclosed in the references listed below, which is typically but not necessarily a phenyl group;
   (c) and/or a combination thereof; and

(2) the compounds including the metal-carbene bonds may further include ancillary ligands selected from the group consisting of the ancillary ligands such as disclosed in the following references:

U.S. Pat. Application Publ. No. 2002-0034656 (K&K 10020/15303), FIGS. 11-50, U.S. Pat. Application Publ. No. 2003-0072964 (Thompson et al.), paragraphs 7-132; and FIGS. 1-8; U.S. Pat. Application Publ. No. 2002-0182441 (Lamansky et al.), paragraphs 13-165, including FIGS. 1-9(g); U.S. Pat. No. 6,420,057 B1 (Ueda et al.), col. 1, line 57, through col. 88, line 17, including each compound I-1 through XXIV-12; U.S. Pat. No. 6,383,666 B1 (Kim et al.), col. 2, line 9, through col. 21, line 67; U.S. Pat. Application Publ. No. 2001-0015432 A1 (Igarashi et al.), paragraphs 2-57, including compounds (1-1) through (1-30); U.S. Pat. Application Publ. No. 2001-0019782 A1 (Igarashi et al.), paragraphs 13-126, including compounds (1-1) through (1-70), and (2-1) through (2-20); U.S. Pat. Application Publ. No. 2002-0024293 (Igarashi et al.), paragraphs 7-95, including general formulas K-I through K-VI, and example compounds (K-1) through (K-25); U.S. Pat. Application Publ. No. 2002-0048689 A1 (Igarashi et al.), paragraphs 5-134, including compounds I-81, and example compounds (1-1) through (1-81); U.S. Pat. Application Publ. No. 2002-0063516 (Tsuboyama et al.), paragraphs 31-161, including each compound 1-16; U.S. Pat. Application Publ. No. 2003-0068536 (Tsuboyama et al.), paragraphs 31-168, including each compound in Tables 1-17, corresponds to EP-1-239-526-A2; U.S. Pat. Application Publ. No. 2003-0091862 (Tokito et al.), paragraphs 10-190, including each compound in Tables 1-17, corresponds to EP-1-239-526-A2; U.S. Pat. Application Publ. No. 2003-0096138 (Lecloux et al.), paragraphs 8-124, including FIGS. 1-5; U.S. Pat. Application Publ. No. 2002-0190250 (Grushin et al.), paragraphs 9-191; U.S. Pat. Application Publ. No. 2002-0121638 (Grushin et al.), paragraphs 8-125; U.S. Pat. Application Publ. No. 2003-0068526 (Kamatani et al.), paragraphs 33-572, including each compound in Tables 1-23; U.S. Pat. Application Publ. No. 2003-0141809 (Furugori et al.), paragraphs 29-207; U.S. Pat. Application Publ. No. 2003-0162299 A1 (Hsieh et al.), paragraphs 8-42; WO 03/084972, (Stossel et al.), Examples 1-33; WO 02/02714 A2 ((Petrov et al.), pages 2-30, including each compound in Tables 1-5; EP 1-191-613 A1 (Takiguchi et al.), paragraphs 26-87, including each compound in Tables 1-8, (corresponding to U.S. Pat. Application Publ. No. 2002-0064681); and EP 1-191-614 A2 (Tsuboyama et al.), paragraphs 25-86, including each compound in Tables 1-7; which are incorporated herein by reference in their entirety.

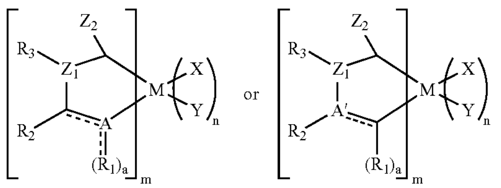
Carbene ligands may be synthesized using methods known in the art, such as those disclosed in Cattoën, et al., *J. Am. Chem. Soc.,* 2004, 126; 1342-1343; Chiu-Yuen Wong, et al, *Organometallics* 2004, 23, 2263-2272; Klapars, et al, *J. Am. Chem. Soc.,* 2001, 123; 7727-7729; Bourissou et al. *Chem. Rev.* 2000, 100, 39-91; Siu-Wai Lai, et al, *Organometallics* 1999, 18, 3327-3336; Wen-Mei Xue et al., *Organometallics* 1998, 17, 1622-1630; Wang & Lin, *Organometallics* 1998, 17, 972-975; Cardin, et al., *Chem. Rev.* 1972, 5, 545-574; and other references discussed herein.

In one embodiment, a phosphorescent emissive compound having the following formula is provided:

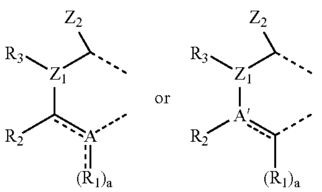


wherein Z^1 and Z^2 may be a carbon containing moiety, an amine containing moiety, oxygen containing moiety, a phosphine containing moiety, and a sulfur containing moiety.

In another embodiment, the compound has the structure:



in which the ligands have the structure:



in which

M is a metal;

the dotted lines represent optional double bonds;

each Z_1, A, and A' is independently selected from C, N, O, P, or S;

R^1, R^2, and R^3 are independently selected from H, alkyl, aryl or heteroaryl; and additionally or alternatively, one or more of R^1 and R^2 and R^2 and R^3 together from independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents J; each substituent J is independently selected from the group consisting of R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, NO_2, SO_2, SOR', or SO_3R', and additionally, or alternatively, two J groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; (X-Y) is selected from a photoactive ligand or an ancilliary ligand,

a is 0, 1, or 2.

m is a value from 1 to the maximum number of ligands that may be attached to the metal;

m+n is the maximum number of ligands that may be attached to metal M.

The term "halo" or "halogen" as used herein includes fluorine, chlorine, bromine and iodine.

The term "alkyl" as used herein contemplates both straight and branched chain alkyl radicals. Preferred alkyl groups are those containing from one to fifteen carbon atoms and includes methyl, ethyl, propyl, isopropyl, butyl, isobutyl, tert-butyl, and the like. Additionally, the alkyl group may be optionally substituted with one or more substituents selected from halo, CN, CO_2R, C(O)R, NR_2, cyclic-amino, NO_2, and OR.

The term "cycloalkyl" as used herein contemplates cyclic alkyl radicals. Preferred cycloalkyl groups are those containing 3 to 7 carbon atoms and includes cyclopropyl, cyclopentyl, cyclohexyl, and the like. Additionally, the cycloalkyl group may be optionally substituted with one or more substituents selected from halo, CN, CO_2R, C(O)R, NR_2, cyclic-amino, NO_2, and OR.

The term "alkenyl" as used herein contemplates both straight and branched chain alkene radicals. Preferred alkenyl groups are those containing two to fifteen carbon atoms. Additionally, the alkenyl group may be optionally substituted with one or more substituents selected from halo, CN, CO_2R, C(O)R, NR_2, cyclic-amino, NO_2, and OR.

The term "alkynyl" as used herein contemplates both straight and branched chain alkyne radicals. Preferred alkyl groups are those containing two to fifteen carbon atoms. Additionally, the alkynyl group may be optionally substituted with one or more substituents selected from halo, CN, CO_2R, C(O)R, NR_2, cyclic-amino, NO_2, and OR.

The terms "alkylaryl" as used herein contemplates an alkyl group that has as a substituent an aromatic group. Additionally, the alkylaryl group may be optionally substituted on the aryl with one or more substituents selected from halo, CN, CO_2R, C(O)R, NR_2, cyclic-amino, NO_2, and OR.

The term "heterocyclic group" as used herein contemplates non-aromatic cyclic radicals. Preferred heterocyclic groups are those containing 3 or 7 ring atoms which includes at least one hetero atom, and includes cyclic amines such as morpholino, piperidino, pyrrolidino, and the like, and cyclic ethers, such as tetrahydrofuran, tetrahydropyran, and the like.

The term "aryl" or "aromatic group" as used herein contemplates single-ring groups and polycyclic ring systems. The polycyclic rings may have two or more rings in which two carbons are common by two adjoining rings (the rings are "fused") wherein at least one of the rings is aromatic, e.g., the other rings can be cycloalkyls, cycloalkenyls, aryl, heterocycles and/or heteroaryls.

The term "heteroaryl" as used herein contemplates single-ring hetero-aromatic groups that may include from one to three heteroatoms, for example, pyrrole, furan, thiophene, imidazole, oxazole, thiazole, triazole, pyrazole, pyridine, pyrazine and pyrimidine, and the like. The term heteroaryl also includes polycyclic hetero-aromatic systems having two or more rings in which two atoms are common to two adjoining rings (the rings are "fused") wherein at least one of the rings is a heteroaryl, e.g., the other rings can be cycloalkyls, cycloalkenyls, aryl, heterocycles and/or heteroaryls.

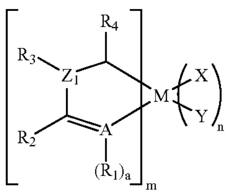
All value ranges, for example those given for n and m, are inclusive over the entire range. Thus, for example, a range between 0-4 would include the values 0, 1, 2, 3 and 4.

Embodiments include photoactive carbene ligands. A ligand is referred to as "photoactive" because it is believed that it contributes to the photoactive properties of the emissive material. m represents the number of photoactive ligands. For example, for Ir, m may be 1, 2 or 3. n, the number of "ancillary" ligands of a particular type, may be any integer from zero to one less than the maximum number of ligands that may be attached to the metal. (X-Y) represents an ancillary ligand. These ligands are referred to as "ancillary" because it is believed that they may modify the photoactive properties of the molecule, as opposed to directly contributing to the photoactive properties. The definitions of photoactive and ancillary are intended as non-limiting theories. For example, for Ir, n may be 0, 1 or 2 for bidentate ligands. Ancillary ligands for use in the emissive material may be selected from those known in the art. Non-limiting examples of ancillary ligands may be found in PCT Application Publication WO 02/15645 A1 to Lamansky et al. at pages 89-90, which is incorporated herein by reference.

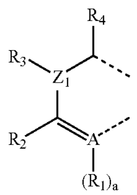
The metal forming the metal-carbene bond may be selected from a wide range of metals. Preferred metals include main group metals, 1^{st} row transition metals, 2^{nd} row transition metals, 3^{rd} row transition metals, and lanthanides. Although one skilled in the art typically expects room temperature phosphorescence only from metal atoms that exert a strong heavy atom effect, phosphorescent emission has been observed in Kunkley, et al. *J. Organometallic Chem.* 2003, 684, 113-116 for a compound with a Nickel (Ni) metal, which is typically not expected to exert a strong heavy atom effect. Thus, embodiments also include first row transition metal, such as Ni, and other metals that do not normally exert a strong heavy atom effect but exhibits phosphorescent emission when coordinated to one or more carbene ligands. More preferred metals include 3^{rd} row transition metals. The following are also preferred metals: Ir, Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, and Ag. Most preferably, the metal is Iridium.

The most preferred embodiments are N-heterocyclic carbenes, which Bourissou has also reported as having "remarkable stability" as free compounds in Bourissou et al. *Chem Rev.* 2000, 100, 39-91.

In one embodiment, the metal-carbene compound has the structure

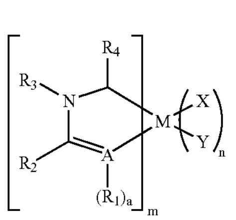


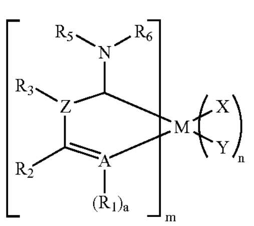
and a ligand with the structure



in which R^4 is either an aromatic or an amine group; and R^3 and R^4 together from independently a 5 or 6-member cyclic group, which may be cycloalkyl, cycloheteroalkyl, aryl or heteroaryl, and which may optionally be substituted by one or more substituents J.

In other embodiments, the metal-carbene compound may have one of the following structures





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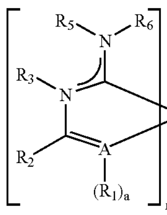
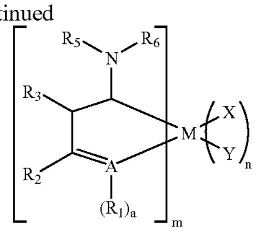
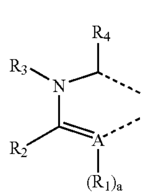
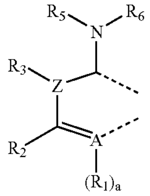
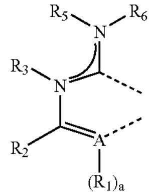




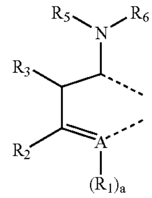
in which the ligand has the corresponding structure selected from:





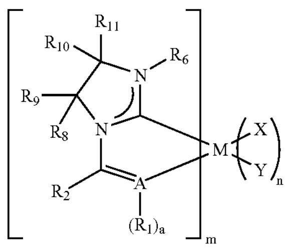


and

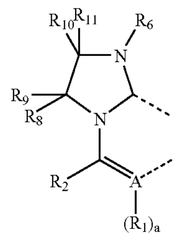


in which R^5 and R^6 may be alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', or SO_3R' halo, aryl and heteroaryl; and each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; and additionally or alternatively, one or more of R^1 and R^2, R^2 and R^3, R^3 and R^5, and R^5 and R^6 together form independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents J.

In another embodiment the metal carbene compound has the structure:

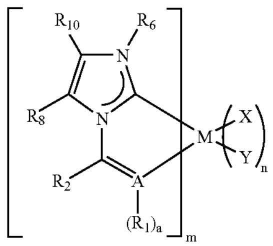


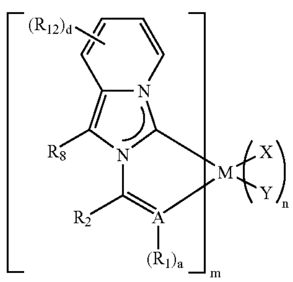
and the carbene ligand has the structure



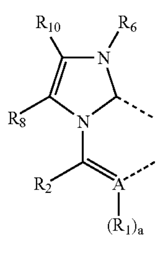
in which R^8, R^9, R^{10}, and R^{11} may be alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', or SO_3R' halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; and additionally or alternatively, one or more of R^1 and R^2, R^2 and R^8, R^8 and R^{10}, and R^6 and R^{10} together form independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents J.

In another embodiment, the carbene-metal compound may have one of the structures below:

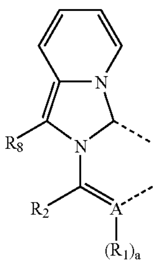




in which the ligand has the structure selected from

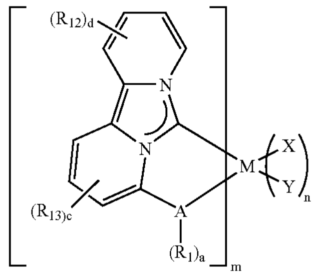


and

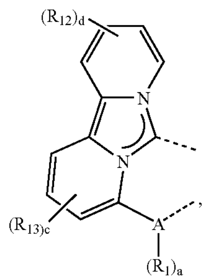


in which each R_{12} may be an alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', or SO_3R' halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; or alternatively, two R_{12} groups on adjacent ring atoms may form a fused 5- or 6-membered cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents J; and d is 0, 1, 2, 3, or 4.

Another embodiment has a metal-carbene structure:

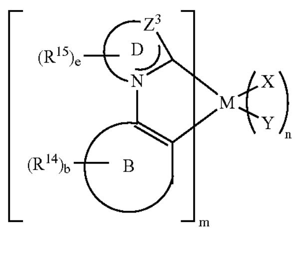


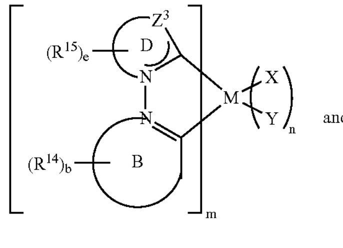
with a ligand having the structure



in which each R_{13} may be an alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', or SO_3R' halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; or alternatively, two R_{13} groups on adjacent ring atoms may form a fused 5- or 6-membered cyclic group, in which the cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and which is optionally substituted by one or more substituents J; and c may be 0, 1, 2, or 3.

Preferred embodiments include metal-carbene compounds having the structure selected from:





and

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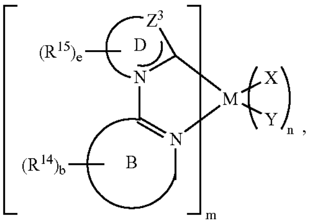
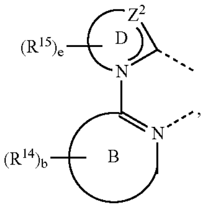
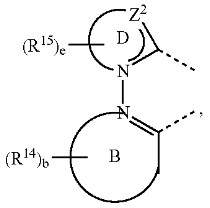
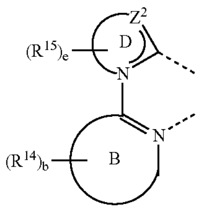


with corresponding ligands having the structures selected from



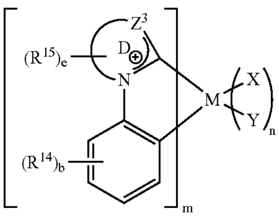


and

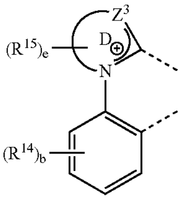


in which Z^3 may be O, S, N—R^6, or P—R^6; and ring B is independently an aromatic cyclic, heterocyclic, fused cyclic, or fused heterocyclic ring with at least one carbon atom coordinated to metal M, in which ring B may be optionally substituted with one or more substituents R_{14}; and ring D is independently a cyclic, heterocyclic, fused cyclic, or fused heterocyclic ring with at least one carbon atom coordinated to metal M, in which ring B may be optionally substituted with one or more substituents R_{15}; and R_{14} and R_{15} are independently selected from alkyl, alkenyl, alkynyl, aralkyl, R', O—R', $N(R')_2$, SR', C(O)R', C(O)OR', $C(O)NR'_2$, CN, CF_3, NO_2, SO_2, SOR', or SO_3R' halo, aryl and heteroaryl; each R' is independently selected from H, alkyl, alkenyl, alkynyl, heteroalkyl, aralkyl, aryl and heteroaryl; or alternatively, two R_{14} groups on adjacent ring atoms and R_{15} groups on adjacent ring atoms form a fused 5- or 6-membered cyclic group, in which the cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and which is optionally substituted by one or more substituents J; b may be 0, 1, 2, 3, or 4; and e may be 0, 1, 2, or 3.

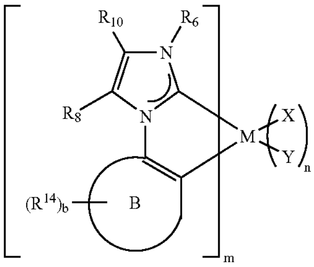
In one embodiment the metal-carbene compound has the structure:

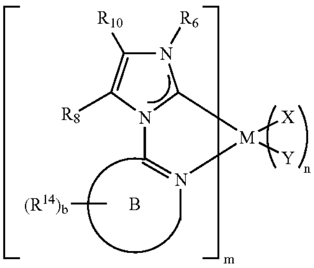


in which the ligand has the structure

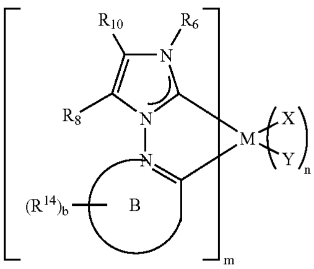


Preferably, the compound has the structure:

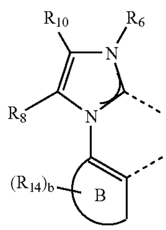




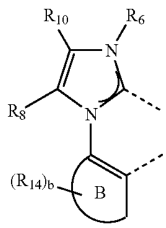
or



and the ligand has the structure:



or



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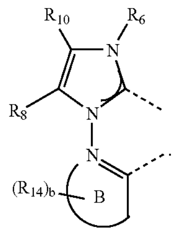
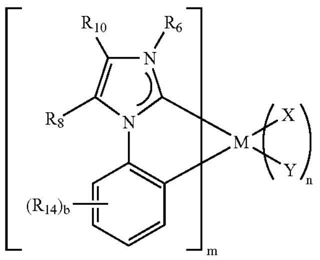
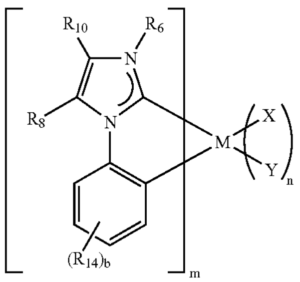
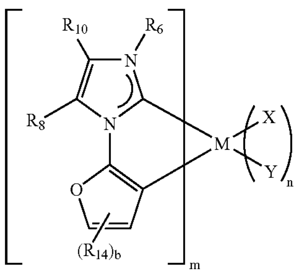
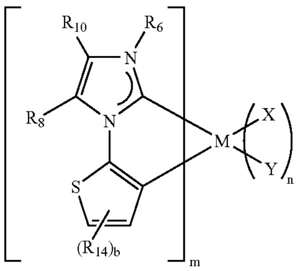


More preferably the metal-carbene has a structure selected from:









and

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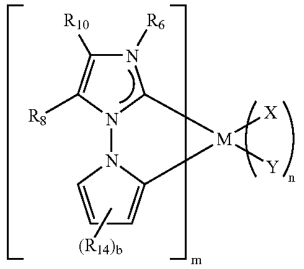
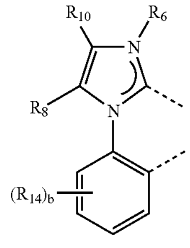
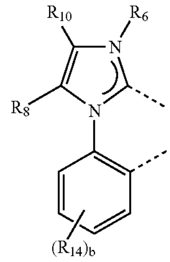
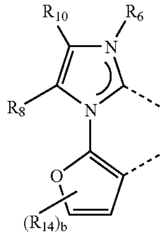
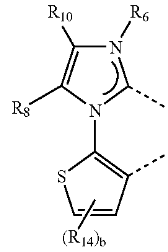


and the ligand from

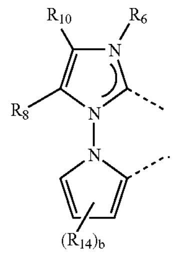




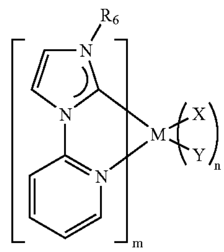




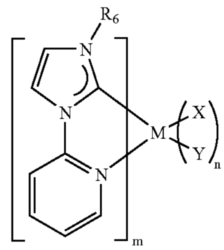
and



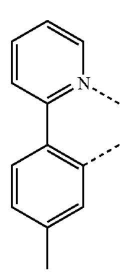
Another preferred embodiment has the structure:

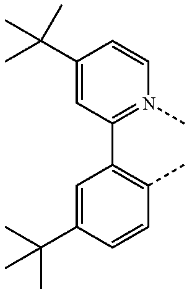


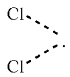
in which the ligand has the structure



in which R_6 is an alkyl or aryl group. In a most preferred embodiment, the metal is Ir. Preferably, m is 3 and n is 0. In one embodiment, R_6 is methyl. In another embodiment m is 2 and n is one. The ancillary ligand X-Y may have one of the following structures:

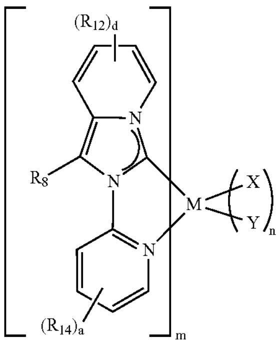


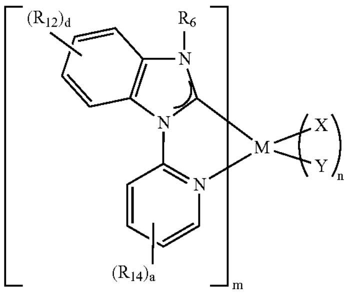


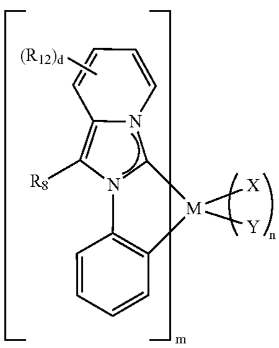


Other preferred ancillary ligands are acetylacetonate, picolinate, and their derivatives.

Other preferred embodiments have the following general structures:







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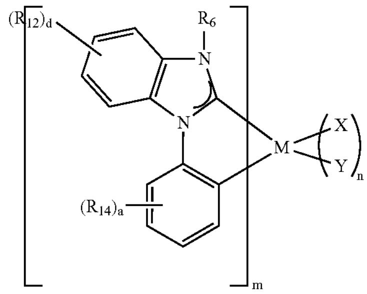

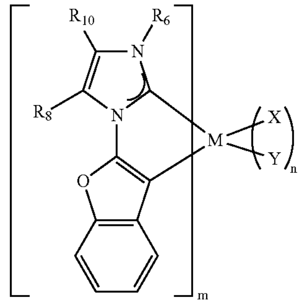

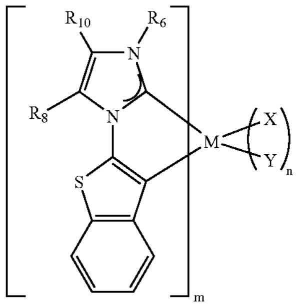

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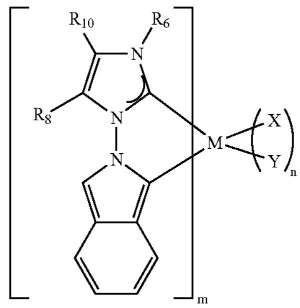
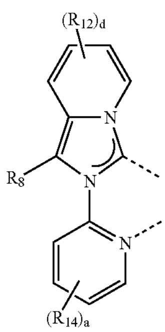
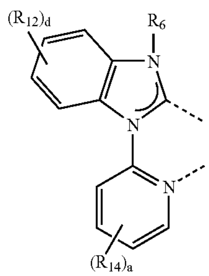


in which the ligands have the structure





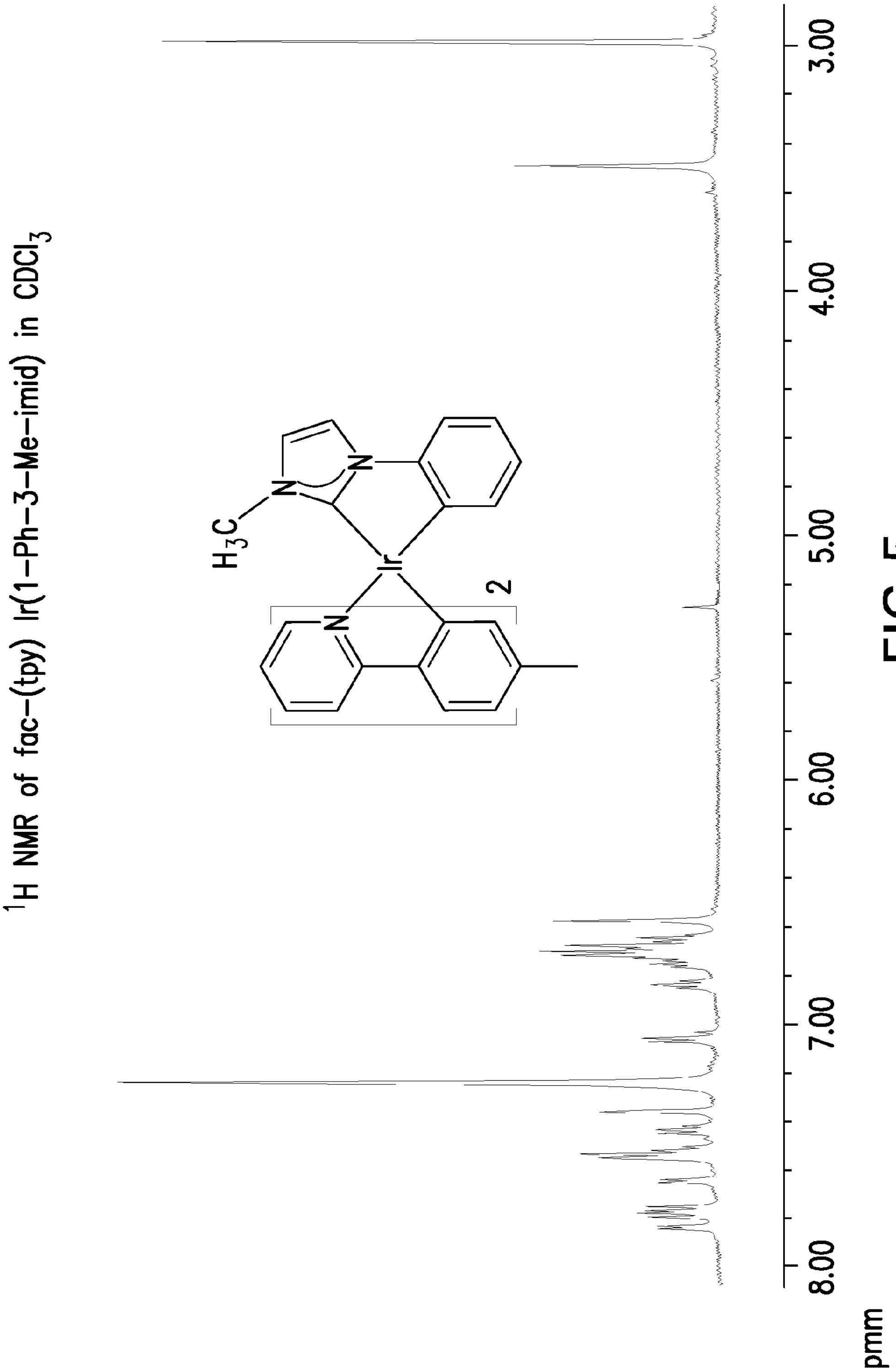

^{1}H NMR of fac-(tpy) Ir(1-Ph-3-Me-imid) in $CDCl_3$
H_3C
N
N
Ir
N
2
3.00
4.00
5.00
6.00
7.00
8.00
pmm

FIG. 5

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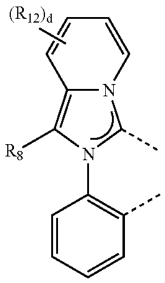
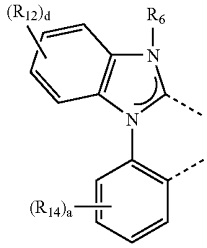
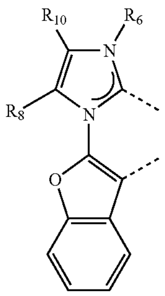
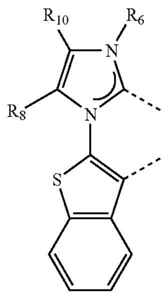
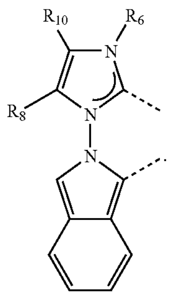




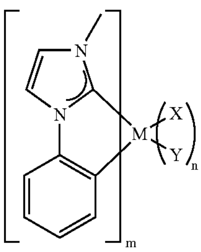


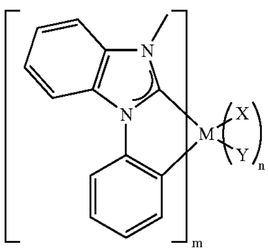


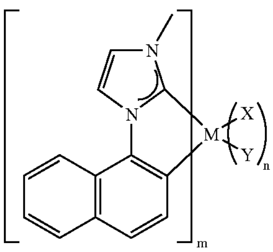
or

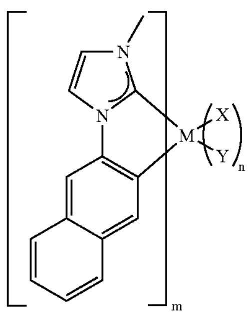


More preferred embodiments have the following structures:









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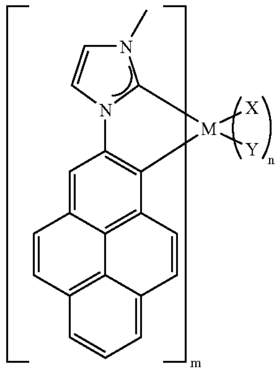

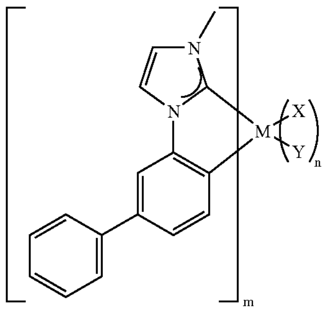

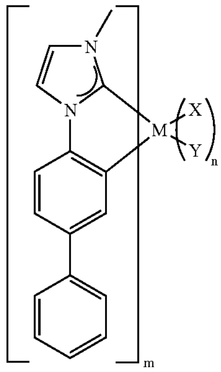

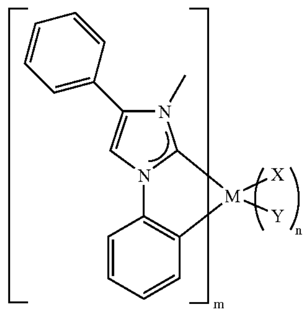

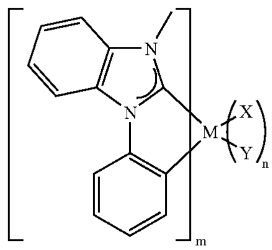

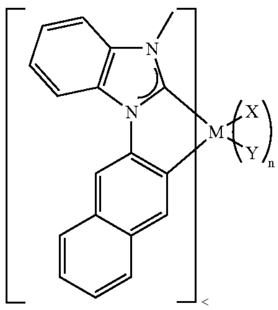

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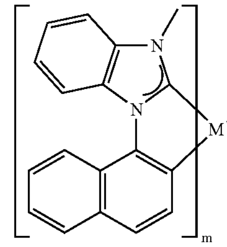

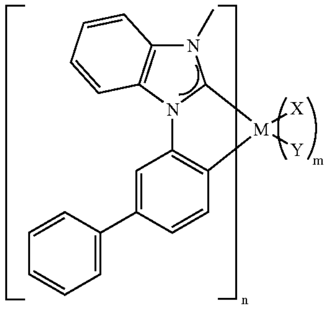

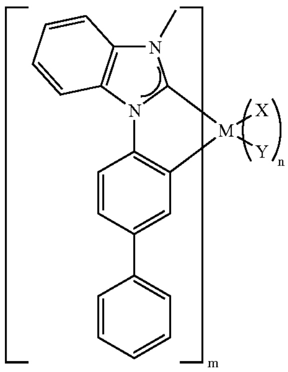

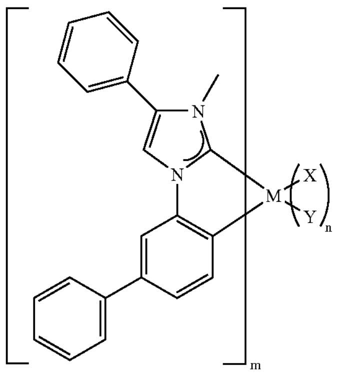

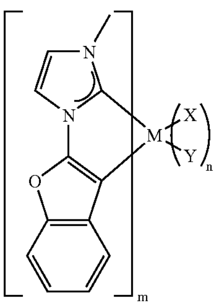

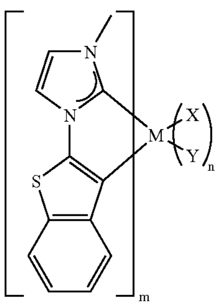

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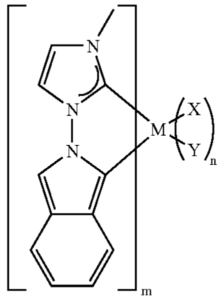
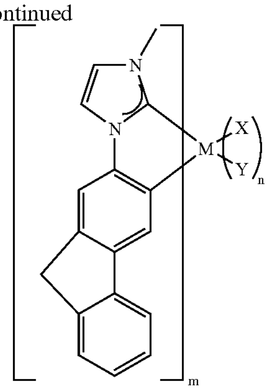
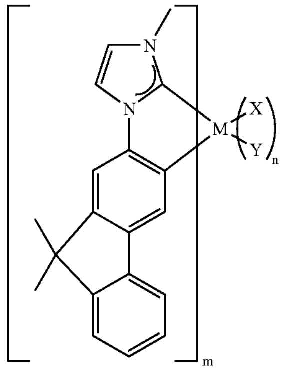
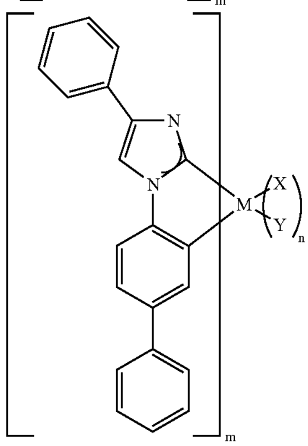
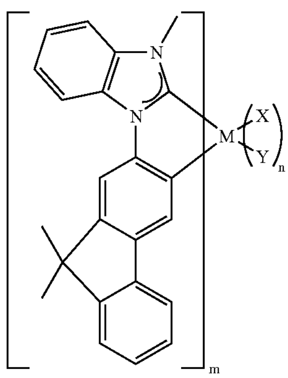


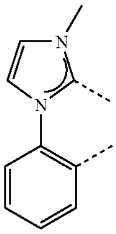
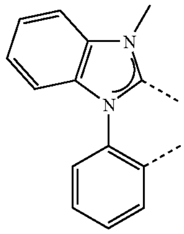
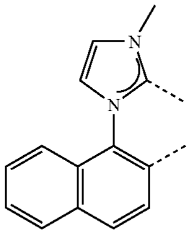
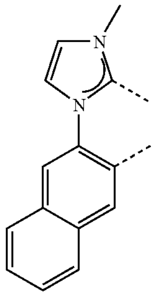
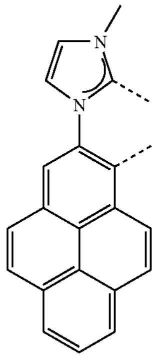
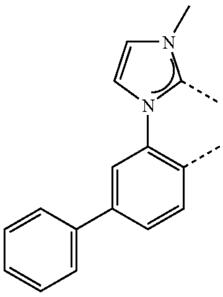
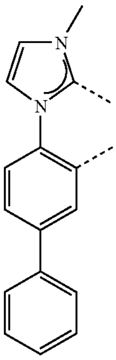
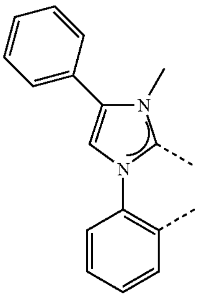
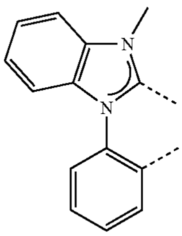
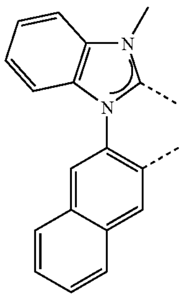
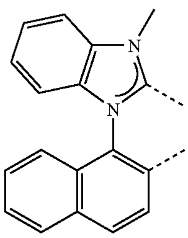








and more preferred ligands have the following corresponding structures

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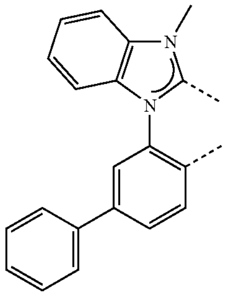
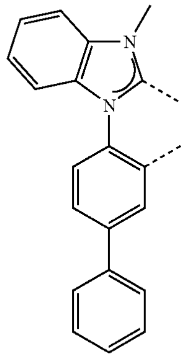
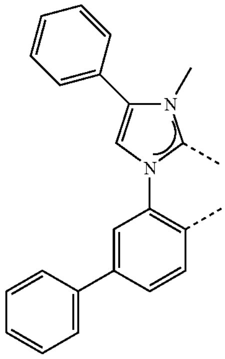
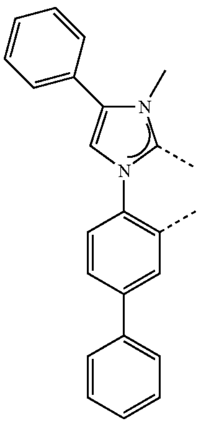
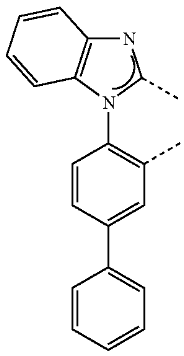
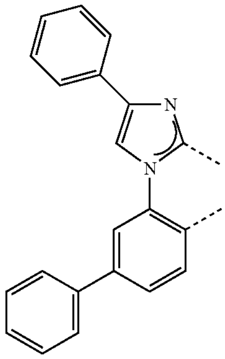
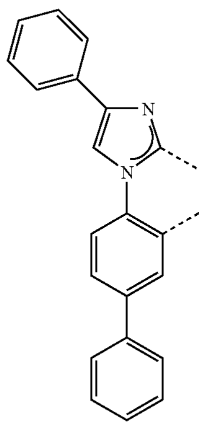
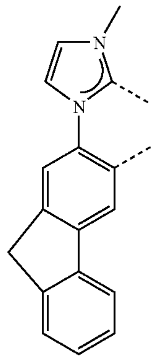

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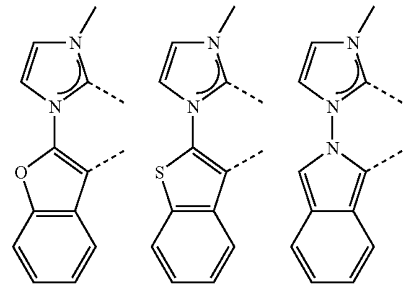

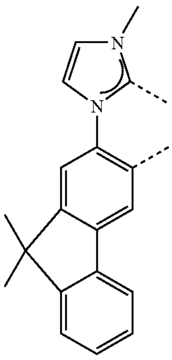

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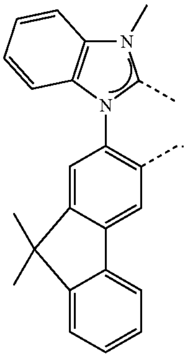
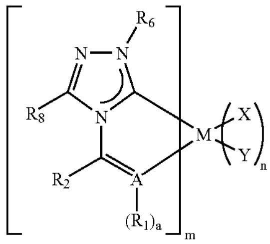


Other embodiments may have the general structure:



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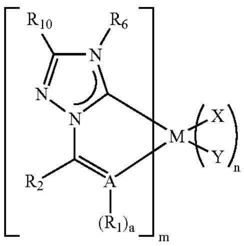
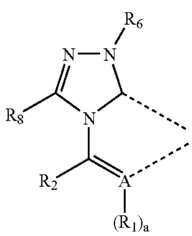


and the ligands may have the corresponding structure



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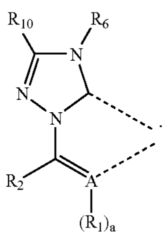
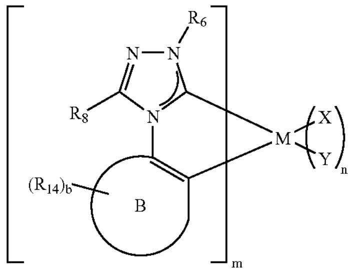
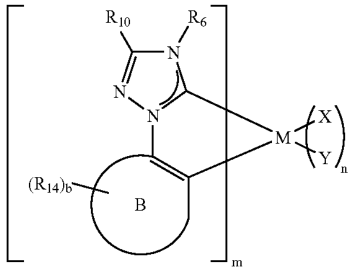
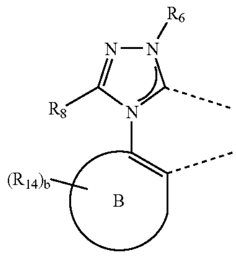


Preferably, the metal-carbene compound has the structure:





and the carbene ligand has the structure



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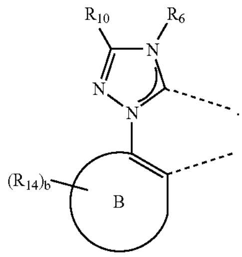
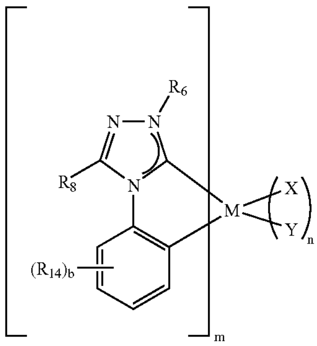
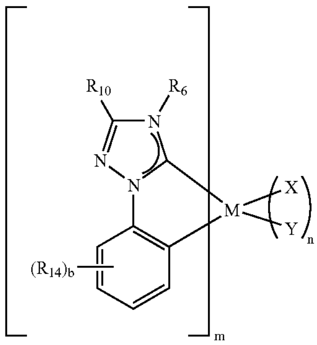


Other preferred embodiments include:





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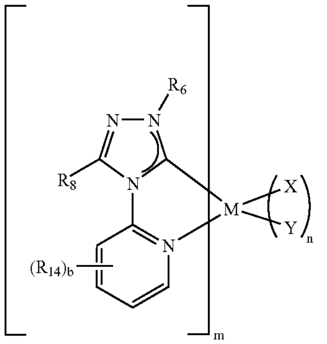

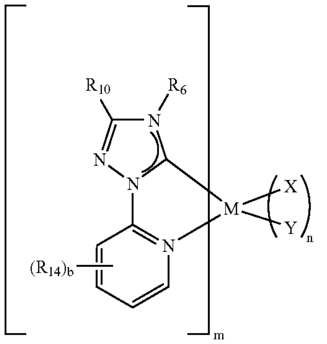

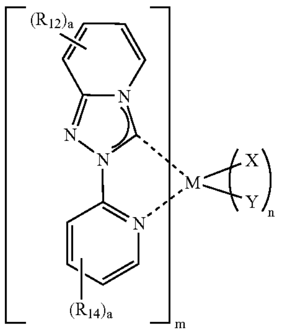

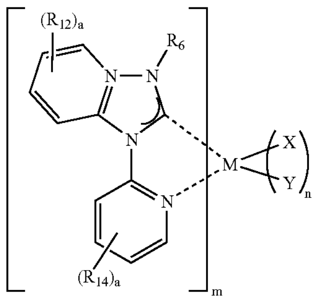

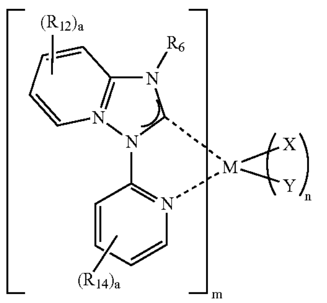

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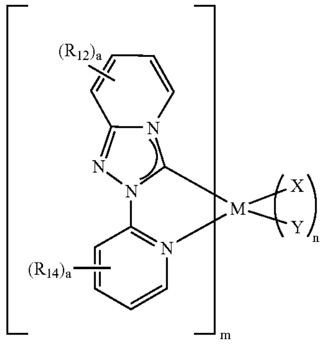
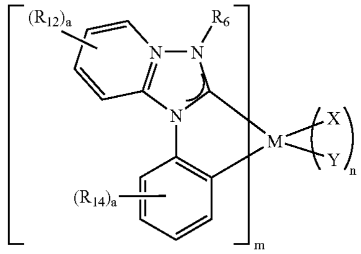
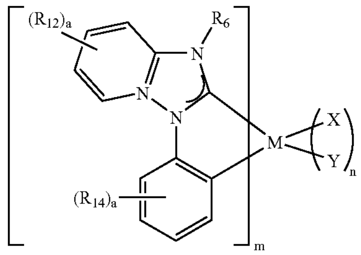
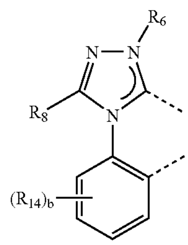
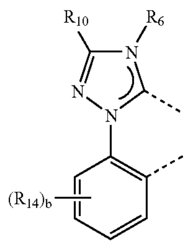


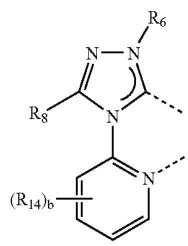


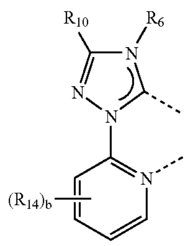


in which the ligands have the structure:









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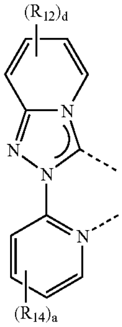
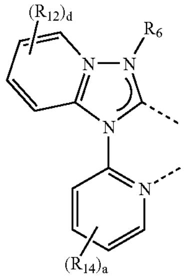
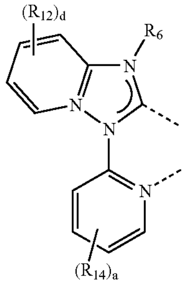
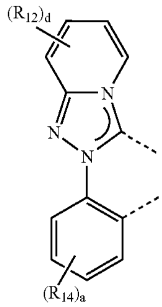
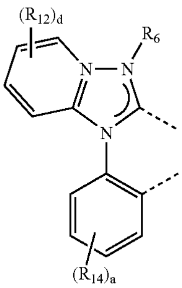
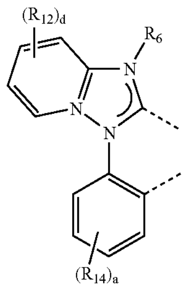




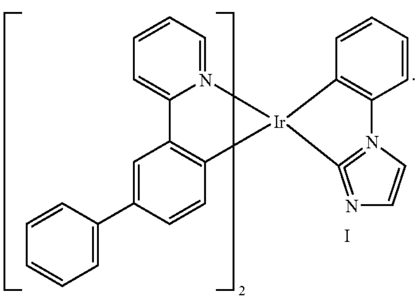




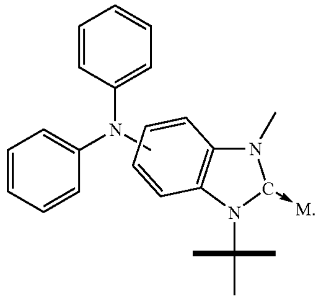




Other embodiments also include compounds having ancillary carbene ligands. For example, the dopant in the device of Examples 13 and 14 is an Iridium compound having two photoactive phenylpyridine (ppy) ligands and one carbene ancillary ligand:

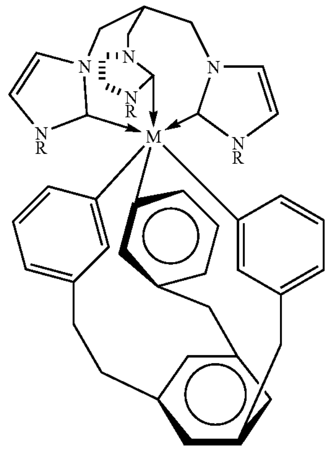


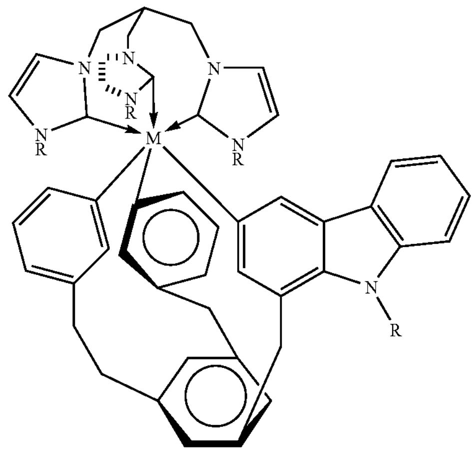
In other embodiments, the carbene ligand may be substituted to affect charge transport. For example, a triarylamine (TAA), which has been used as a hole transport material, may be a substituent, as shown in the partial structure below:



This type of substitution may also be designed to trap charges to control recombination in the emissive layer, which may lead to more stable and efficient devices.

Other embodiments include tripodal ligands, such as those shown below. Substituents may include groups that are believed to be emissive or have charge transport properties.





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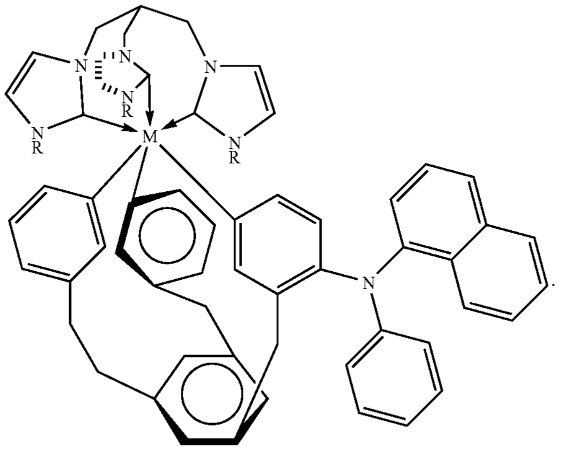
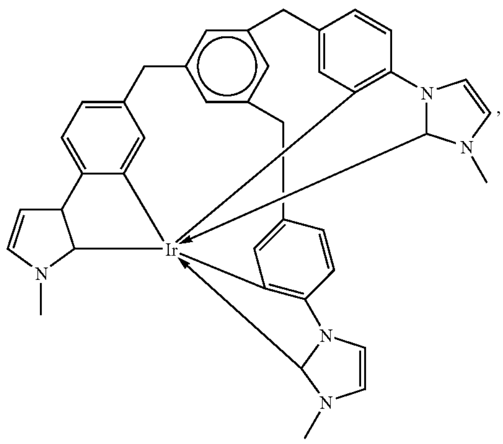
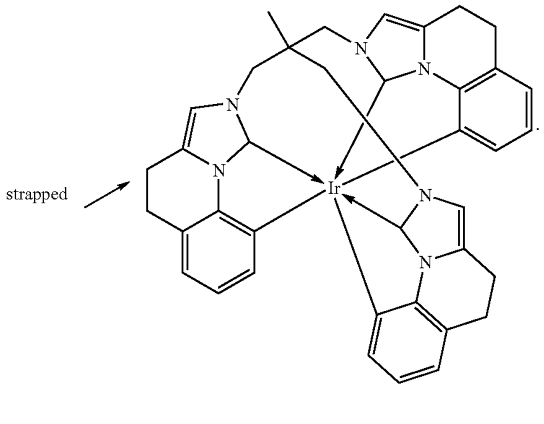


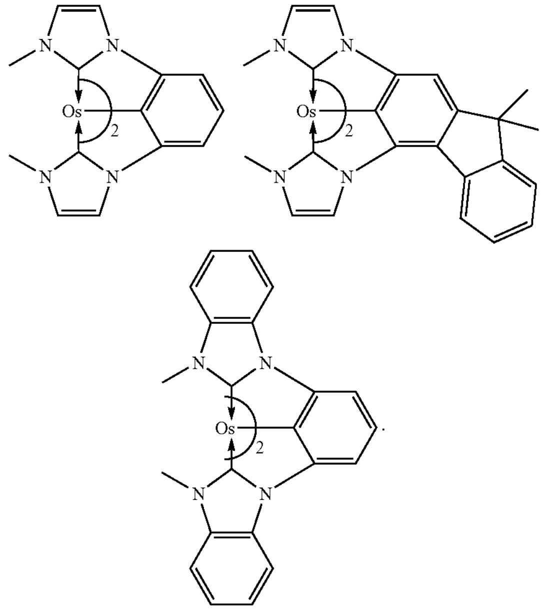
Other embodiments that may be preferred for include carbenes that exhibit improved stability or are easier to synthesize. These include hexadentate carbene complexes, which may be linked by a phenyl ring, for example:



and complexes wherein the rings of the ligand are strapped, for example:



Other embodiments include tridentate osmium complexes. Preferably, the complex has two carbenes and one anionic phenyl ring, such as:



Other embodiments include:

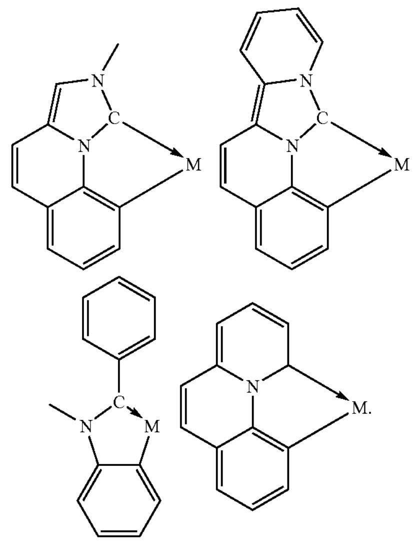


Table 38 lists partial structures of carbene compounds ("A" part of the ligand), which in combination with the partial structures listed in Table 39 ("B" part of the ligand) make up additional embodiments. Specifically, representative embodiments include compounds having the core chemical structure of AxBy, wherein x is an integer from 1 to 47, preferably 1, 2, 5, 6, 7, 18, 19, 20, 33, or 35, and y is an integer from 1 to 86, preferably 1, 4, 10, 12, 55, 56, 59, 61, 62, 65, 66, 69, 70, 71, or 72. Preferably, the Ra1 substituent is an alkyl, an un-substituted aryl group, or an aryl group substituted with one or more electron donor groups, such as alkylamine, alkoxy, alkyl, or thiol groups, or electron acceptor groups, such as carboxylate, carbonyl, cyano, sulfoxide, sulfone, nitro, or phenyl groups, and the remaining Ra-substituents and Rb-substituents may be H, an alkyl group, an un-substituted aryl group, or an aryl group substituted with one or more electron donor or electron acceptor groups. Specific representative embodiments are shown in Tables 1-37, wherein the carbon and nitrogen positions are numbered for the convenient use of these tables. Some preferred embodiments are shown in Table 41. Other embodiments are shown in Table 40.

Preferred "B" parts of the carbene ligand include triphenylenes, e.g., B29 and B46, fluorenes, e.g., B55-B60, and carbazoles, e.g., B61-B66, which are believed to have high triplet energies and may be potential blue phosphors. In addition, it is well known in the art that carbazole is a stable host and is used in hole transport layers in OLEDs. Other "B" parts of the carbene ligand may be useful as red or green emitters or charge transporters. When a heteroatom not bound to the metal is present in the A or B ring, it is preferred that the heteroatom-carbon bonds are single bonds (e.g., B67, B70, B73, B76, and B79) rather than double bonds because it is believed that the heteroatom-carbon double bonds may be more susceptible to nucleophilic attacks which may lead to reduced device stability.

It is also believed that nitrogen containing heterocyclic rings with no formal double bonds to the nitrogen, e.g., B67, B70, B73, B76, and B79 lead to better device stability.

Each specific individual compound may be represented as "AxBy-z1-z2," wherein z1-z2 is the compound number ("Cpd No.") as shown in the tables. For the z1-z2 component, the prefix z1 corresponds to the table number and the suffix z2 corresponds to the line number of that table, thus specifically identifying the individual compound. For example, for the core chemical structure of A1B1, which has two carbon atoms available for substitution on the "A" part of the ligand and four available carbon atoms on the "B" part of the ligand, Table 2 is used, since it lists specific embodiments for a structure having two available carbon atoms on the "A" part of the ligand and four available carbon atoms on the "B" part of the ligand. Thus, for the compound having the identifying number "A1B1-2-1," Ra1 is methyl and Ra2, Ra3, Rb1, Rb2, Rb3 and Rb4 are each H; for "A1B1-2-2," Ra1 and Rb1 are each methyl and Ra2, Ra3, Rb2, Rb3 and Rb4 are each H; and for "A1B1-2-3," Ra1 and Rb2 are each methyl and Ra2, Ra3, Rb1, Rb3 and Rb4 are each H.

For AxBy complexes wherein m=3, there are known to be two stereo-isomers, one that is typically referred to as the "mer" isomer and the other as the "fac" isomer. Thus, using the compound identifying terminology, as defined herein, the mixture of both isomers is identified as "AxBy-z1-z2," whereas the "mer" isomer is identified as "mer-AxBy-z1-z2," and the "fac" isomer, as "fac-AxBy-z1-z2." As would be understood by one skilled in the art, steric considerations may either limit or favor the synthesis of particular embodiments. For example, having large bulky groups on adjacent positions could hinder the synthesis of certain compounds. Alternatively, there may be particular groups that improve ease of synthesis, solubility, sublimation temperature, and/or thermal stability of certain compounds. For example, for each of the embodiments having a ligand with a fluorene group, such as the B55, B56 or B59 groups, or a carbazole group, such as the B61, B62, B65 or B66 groups, the methyl groups that are on the methylene carbon of fluorene groups, for example, the R7 and R8 positions on B55, or on the N-atom of the carbazole group, for example, the R7 position of B61, the methyl groups that are shown in the tables at these positions may instead readily be phenyl groups that form highly stable compounds.

Thus, as specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B1, wherein M is Ir, m=3, n=0, and each R-substituent is H, methyl ("Me") or phenyl ("Ph"), with specific individual compounds having the core chemical structure of A1B1 being listed in Table 2.

As further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B4 being listed in Table 3.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B10 being listed in Table 5.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B12 being listed in Table 5.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B55 being listed in Table 33

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B56 being listed in Table 33.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B59 being listed in Table 33.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B61 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B62 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B65 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B66 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B69 being listed in Table 1.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B70 being listed in Table 21.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B71 being listed in Table 2.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A1B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A1B72 being listed in Table 2.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B1 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B4 being listed in Table 13.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B10 being listed in Table 15.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B12 being listed in Table 15.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B55 being listed in Table 35

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B56 being listed in Table 35.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B59 being listed in Table 35.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B61 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B62 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B65 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B66 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B69 being listed in Table 11.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B70 being listed in Table 23.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B71 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A2B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A2B72 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B1 being listed in Table 2.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B4 being listed in Table 3.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B10 being listed in Table 5.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B12 being listed in Table 5.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B55 being listed in Table 33

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B56 being listed in Table 33.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B59 being listed in Table 33.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B61 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B62 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B65 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B66 being listed in Table 4.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B69 being listed in Table 1.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B70 being listed in Table 21.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B71 being listed in Table 2.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A5B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A5B72 being listed in Table 2.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B1 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B4 being listed in Table 18.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B10 being listed in Table 20.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B12 being listed in Table 20.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B55 being listed in Table 36

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B56 being listed in Table 36.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B59 being listed in Table 36.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B61 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B62 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B65 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B66 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B69 being listed in Table 16.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B70 being listed in Table 24.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B71 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A6B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A6B72 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B1 being listed in Table 26.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B4 being listed in Table 28.

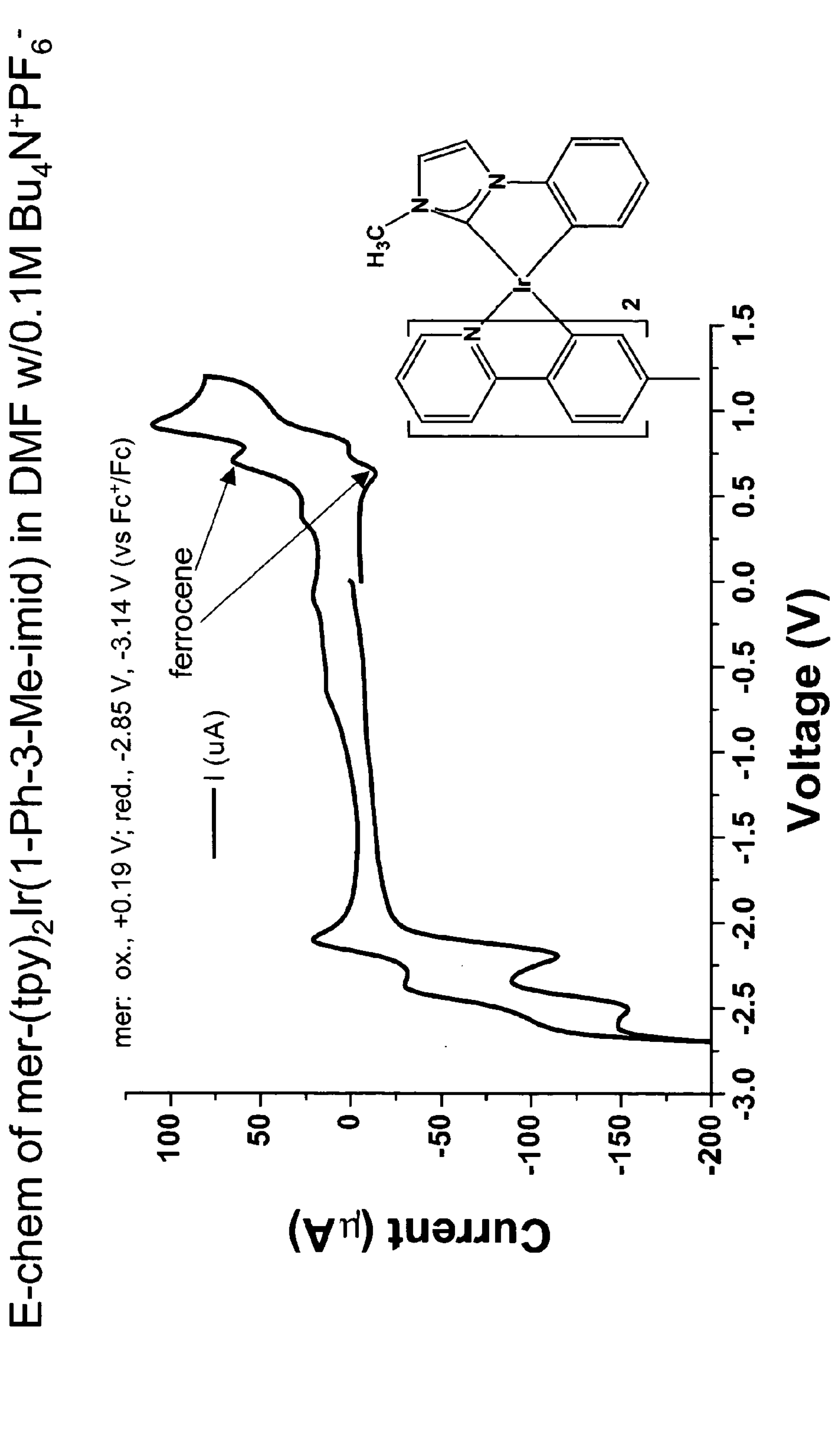
As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B10 being listed in Table 30.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B12 being listed in Table 30.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B55 being listed in Table 37

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B56 being listed in Table 37.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core



E-chem of mer-(tpy)2Ir(1-Ph-3-Me-imid) in DMF w/0.1M Bu4N+PF6-
mer: ox., +0.19 V; red., -2.85 V, -3.14 V (vs Fc+/Fc)
ferrocene
I (uA)
Current (μA)
Voltage (V)
100
50
0
-50
-100
-150
-200
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
H3C
N
N
Ir
N
2

Figure 6

chemical structure of A7B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B59 being listed in Table 37.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B61 being listed in Table 29.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B62 being listed in Table 29.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B65 being listed in Table 29.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B66 being listed in Table 29.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B69 being listed in Table 25.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B70 being listed in Table 27.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B71 being listed in Table 26.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A7B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A7B72 being listed in Table 26.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B1 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B4 being listed in Table 13.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B10 being listed in Table 15.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B12 being listed in Table 15.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B55 being listed in Table 35

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B56 being listed in Table 35.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B59 being listed in Table 35.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B61 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B62 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B65 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B66 being listed in Table 14.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B69 being listed in Table 11.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B70 being listed in Table 23.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B71 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A18B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A18B72 being listed in Table 12.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B1 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B4 being listed in Table 8.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B10 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B12 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B55 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B56 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B59 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B61 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B62 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B65 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B66 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B69 being listed in Table 6.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B70 being listed in Table 22.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B71 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A19B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A19B72 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B1 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B4 being listed in Table 8.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B10 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B12 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B55 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B56 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B59 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B61 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B62 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B65 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B66 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B69 being listed in Table 6.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B70 being listed in Table 22.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B71 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A20B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A20B72 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B1 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B4 being listed in Table 8.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B10 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B12 being listed in Table 10.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B55 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B56 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B59 being listed in Table 34.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B61 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B62 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B65 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B66 being listed in Table 9.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B69 being listed in Table 6.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B70 being listed in Table 22.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B71 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A33B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A33B72 being listed in Table 7.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B1 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B4, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B4 being listed in Table 18.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B10, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B10 being listed in Table 20.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B12, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B12 being listed in Table 20.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B55, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B55 being listed in Table 36

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B56, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B56 being listed in Table 36.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B59, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B59 being listed in Table 36.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B61, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B61 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B62, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B62 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B65, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B65 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B66, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B66 being listed in Table 19.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B69, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B69 being listed in Table 16.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B70, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B70 being listed in Table 24.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B71, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B71 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of A35B72, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of A35B72 being listed in Table 17.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of C1, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of C1 being listed in Table 31.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of C2, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of C2 being listed in Table 31.

As still further specific representative embodiments, the phosphorescent material may be a compound having the core chemical structure of C3, wherein M is Ir, m=3, n=0, with specific individual compounds having the core chemical structure of C3 being listed in Table 32.

Any one of the preceding specific representative embodiments may be selected so as to achieve particular desired device characteristics, for example, emission color, stability, HOMO and/or LUMO energy levels, and/or electron or hole trapping properties of the material. In addition, any one of the preceding specific representative embodiments may be further substituted, for example, with additional electron donor or electron acceptor groups, so as to further adjust certain device properties, such as emission color or stability. For example, any one of the compounds referred to in Tables 1-37 may include one or more additional methyl or phenyl groups, and/or the methyl and/or phenyl groups may be replaced with other aryl or alkyl groups such as ethyl or t-butyl. In addition, one or more of the AxBy ligands of the tris-iridium compound may be replaced with an ancillary "X-Y" ligand, also so as to further adjust the specific device properties, such as emission color or stability. The ancillary "X-Y" ligand may be one or more ligands selected from the group consisting of mono-dentate, bi-dentate, tri-dentate or tetra-dentate ligands. The ancillary ligand may be another organometallic ligand, such as another carbene ligand, or a non-organometallic ligand, such as acetoacetonate and others previously mentioned. Moreover, the iridium atom of any one of the preceding specific representative embodiments may be replaced with another metal atom so as to further adjust particular device properties, such as emission color or stability. The metal atom, other than Ir, may be any 3^{rd} row transition metals, preferably Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, or Ag, more preferably, Pt, Rh, Re, Au, Os, or Ru, and most preferably, Pt.

In addition, any one of the specific representative embodiments may be selected, as listed, or as further modified, so that the materials may be used as an ETL, an HTL, a hole blocking layer, an electron blocking layer, or an exciton blocking layer. In such cases, the compounds may be selected, and/or modified, so as to improve the electron and/or hole conductivity of the material.

The carbene-carbon atom that is bound to the metal atom may in some cases be conjugated with a quaternized N-alkyl unit, which in combination with the carbene-carbon atom may be drawn as a valid zwitter-ion resonance structure, with the carbene-carbon atom and the quaternized nitrogen atom being part of a heterocyclic aromatic ring, such as described in Take-aki Koizumi et al., "Terpyridine-Analogous (N,N,C)-Tridentate Ligands; Synthesis, Structures, and Electrochemical Properties of Ruthenium (II) Complexes Bearing Tridentate Pyridinium and Pyridinylidene Ligands," Organometallics, Vol 22, pp. 970-975 (2003), wherein the nitrogen atom is, for example, in the para position relative to the carbene-carbon atom. Thus, insofar as a carbene may be properly characterized as having a valid zwitter-ion resonance structure, such a ligand is represented, for example, by the ligands that include the B19 unit as part of the ligand.

One of the unifying features of the preferred representative embodiments that are specifically disclosed herein is that they all have as a core part of their chemical structure a cyclometallated, five-member, ring, which includes a metal atom bound to two carbon atoms within the ring, wherein one of the metal-carbon bonds is a metal-carbene bond and the other is a metal-mono-anionic carbon bond. Such structures are analogous to the metal-ppy-based complexes that are typically used in phosphorescent OLEDs. Such metal-ppy-based chemical structures also have a cyclometallated, five-member, ring as a core part of their chemical structure, except that the metal is bound to a single carbon atom, via a metal-mono-anionic carbon bond, and to a nitrogen atom instead of a carbene carbon. Because of the close structural analogy between the carbene-based complexes disclosed herein and metal-ppy-based complexes, it is believed herein that selection of the specifically preferred AxBy complexes may be based on considerations similar to those used to selected the preferred metal-ppy-based complexes. For example, since iridium and platinum are the most commonly preferred metals of the phosphorescent metal-ppy-based complexes, due to the very high spin-orbit coupling between the metal atom and the carbon atom, these same two metals are the most preferred metals for use in combination with the carbene-based ligands, but with iridium being more highly preferred. Similarly, it is believed that the methods and materials that have proven useful for achieving the desired characteristics for metal-ppy-based complexes, such as emission color, thermal stability, ease of chemical synthesis, solubility, sublimation temperature, HOMO and LUMO energy levels, and/or reduction of the room temperature losses in quantum efficiency due to quenching of the phosphorescence that may be observed at 77K, may also be applied to selecting the preferred metal-carbene complexes.

It is also believed that the presence of the metal-carbene bond, with its unique chemical characteristics, will lead to further particular benefits and advantages that are unique to metal-carbene complexes, and that may not be readily predicted based on their metal-ppy-based analogues.

TABLE 1

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2
1-1	Me	H	H	H	H
1-2	Me	H	H	Me	H
1-3	Me	H	H	H	Me
1-4	Me	H	H	Ph	H

TABLE 1-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2
1-5	Me	H	H	H	Ph
1-6	Ph	H	H	H	H
1-7	Ph	H	H	Me	H
1-8	Ph	H	H	H	Me
1-9	Ph	H	H	Ph	H
1-10	Ph	H	H	H	Ph
1-11	Me	Me	H	H	H
1-12	Me	Me	H	Me	H
1-13	Me	Me	H	H	Me
1-14	Me	Me	H	Ph	H
1-15	Me	Me	H	H	Ph
1-16	Ph	Me	H	H	H
1-17	Ph	Me	H	Me	H
1-18	Ph	Me	H	H	Me
1-19	Ph	Me	H	Ph	H
1-20	Ph	Me	H	H	Ph
1-21	Me	H	Me	H	H
1-22	Me	H	Me	Me	H
1-23	Me	H	Me	H	Me
1-24	Me	H	Me	Ph	H
1-25	Me	H	Me	H	Ph
1-26	Ph	H	Me	H	H
1-27	Ph	H	Me	Me	H
1-28	Ph	H	Me	H	Me
1-29	Ph	H	Me	Ph	H
1-30	Ph	H	Me	H	Ph
1-31	Me	Ph	H	H	H
1-32	Me	Ph	H	Me	H
1-33	Me	Ph	H	H	Me
1-34	Me	Ph	H	Ph	H
1-35	Me	Ph	H	H	Ph
1-36	Ph	Ph	H	H	H
1-37	Ph	Ph	H	Me	H
1-38	Ph	Ph	H	H	Me
1-39	Ph	Ph	H	Ph	H
1-40	Ph	Ph	H	H	Ph
1-41	Me	H	Ph	H	H
1-42	Me	H	Ph	Me	H
1-43	Me	H	Ph	H	Me
1-44	Me	H	Ph	Ph	H
1-45	Me	H	Ph	H	Ph
1-46	Ph	H	Ph	H	H
1-47	Ph	H	Ph	Me	H
1-48	Ph	H	Ph	H	Me
1-49	Ph	H	Ph	Ph	H
1-50	Ph	H	Ph	H	Ph

TABLE 2

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4
2-1	Me	H	H	H	H	H	H
2-2	Me	H	H	Me	H	H	H
2-3	Me	H	H	H	Me	H	H
2-4	Me	H	H	H	H	Me	H
2-5	Me	H	H	H	H	H	Me
2-6	Me	H	H	Ph	H	H	H
2-7	Me	H	H	H	Ph	H	H
2-8	Me	H	H	H	H	Ph	H
2-9	Me	H	H	H	H	H	Ph
2-10	Ph	H	H	H	H	H	H
2-11	Ph	H	H	Me	H	H	H
2-12	Ph	H	H	H	Me	H	H
2-13	Ph	H	H	H	H	Me	H
2-14	Ph	H	H	H	H	H	Me
2-15	Ph	H	H	Ph	H	H	H
2-16	Ph	H	H	H	Ph	H	H
2-17	Ph	H	H	H	H	Ph	H
2-18	Ph	H	H	H	H	H	Ph
2-19	Me	Me	H	H	H	H	H
2-20	Me	Me	H	Me	H	H	H
2-21	Me	Me	H	H	Me	H	H
2-22	Me	Me	H	H	H	Me	H
2-23	Me	Me	H	H	H	H	Me
2-24	Me	Me	H	Ph	H	H	H

TABLE 2-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4
2-25	Me	Me	H	H	Ph	H	H
2-26	Me	Me	H	H	H	Ph	H
2-27	Me	Me	H	H	H	H	Ph
2-28	Ph	Me	H	H	H	H	H
2-29	Ph	Me	H	Me	H	H	H
2-30	Ph	Me	H	H	Me	H	H
2-31	Ph	Me	H	H	H	Me	H
2-32	Ph	Me	H	H	H	H	Me
2-33	Ph	Me	H	Ph	H	H	H
2-34	Ph	Me	H	H	Ph	H	H
2-35	Ph	Me	H	H	H	Ph	H
2-36	Ph	Me	H	H	H	H	Ph
2-37	Me	H	Me	H	H	H	H
2-38	Me	H	Me	Me	H	H	H
2-39	Me	H	Me	H	Me	H	H
2-40	Me	H	Me	H	H	Me	H
2-41	Me	H	Me	H	H	H	Me
2-42	Me	H	Me	Ph	H	H	H
2-43	Me	H	Me	H	Ph	H	H
2-44	Me	H	Me	H	H	Ph	H
2-45	Me	H	Me	H	H	H	Ph
2-46	Ph	H	Me	H	H	H	H
2-47	Ph	H	Me	Me	H	H	H
2-48	Ph	H	Me	H	Me	H	H
2-49	Ph	H	Me	H	H	Me	H
2-50	Ph	H	Me	H	H	H	Me
2-51	Ph	H	Me	Ph	H	H	H
2-52	Ph	H	Me	H	Ph	H	H
2-53	Ph	H	Me	H	H	Ph	H
2-54	Ph	H	Me	H	H	H	Ph
2-55	Me	Ph	H	H	H	H	H
2-56	Me	Ph	H	Me	H	H	H
2-57	Me	Ph	H	H	Me	H	H
2-58	Me	Ph	H	H	H	Me	H
2-59	Me	Ph	H	H	H	H	Me
2-60	Me	Ph	H	Ph	H	H	H
2-61	Me	Ph	H	H	Ph	H	H
2-62	Me	Ph	H	H	H	Ph	H
2-63	Me	Ph	H	H	H	H	Ph
2-64	Ph	Ph	H	H	H	H	H
2-65	Ph	Ph	H	Me	H	H	H
2-66	Ph	Ph	H	H	Me	H	H
2-67	Ph	Ph	H	H	H	Me	H
2-68	Ph	Ph	H	H	H	H	Me
2-69	Ph	Ph	H	Ph	H	H	H
2-70	Ph	Ph	H	H	Ph	H	H
2-71	Ph	Ph	H	H	H	Ph	H
2-72	Ph	Ph	H	H	H	H	Ph
2-73	Me	H	Ph	H	H	H	H
2-74	Me	H	Ph	Me	H	H	H
2-75	Me	H	Ph	H	Me	H	H
2-76	Me	H	Ph	H	H	Me	H
2-77	Me	H	Ph	H	H	H	Me
2-78	Me	H	Ph	Ph	H	H	H
2-79	Me	H	Ph	H	Ph	H	H
2-80	Me	H	Ph	H	H	Ph	H
2-81	Me	H	Ph	H	H	H	Ph
2-82	Ph	H	Ph	H	H	H	H
2-83	Ph	H	Ph	Me	H	H	H
2-84	Ph	H	Ph	H	Me	H	H
2-85	Ph	H	Ph	H	H	Me	H
2-86	Ph	H	Ph	H	H	H	Me
2-87	Ph	H	Ph	Ph	H	H	H
2-88	Ph	H	Ph	H	Ph	H	H
2-89	Ph	H	Ph	H	H	Ph	H
2-90	Ph	H	Ph	H	H	H	Ph

TABLE 3

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
3-1	Me	H	H	H	H	H	H	H	H
3-2	Me	H	H	Me	H	H	H	H	H
3-3	Me	H	H	H	Me	H	H	H	H

TABLE 3-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
3-4	Me	H	H	H	H	Me	H	H	H
3-5	Me	H	H	H	H	H	Me	H	H
3-6	Me	H	H	H	H	H	H	Me	H
3-7	Me	H	H	H	H	H	H	H	Me
3-8	Me	H	H	Ph	H	H	H	H	H
3-9	Me	H	H	H	Ph	H	H	H	H
3-10	Me	H	H	H	H	Ph	H	H	H
3-11	Me	H	H	H	H	H	Ph	H	H
3-12	Me	H	H	H	H	H	H	Ph	H
3-13	Me	H	H	H	H	H	H	H	Ph
3-14	Ph	H	H	H	H	H	H	H	H
3-15	Ph	H	H	Me	H	H	H	H	H
3-16	Ph	H	H	H	Me	H	H	H	H
3-17	Ph	H	H	H	H	Me	H	H	H
3-18	Ph	H	H	H	H	H	Me	H	H
3-19	Ph	H	H	H	H	H	H	Me	H
3-20	Ph	H	H	H	H	H	H	H	Me
3-21	Ph	H	H	Ph	H	H	H	H	H
3-22	Ph	H	H	H	Ph	H	H	H	H
3-23	Ph	H	H	H	H	Ph	H	H	H
3-24	Ph	H	H	H	H	H	Ph	H	H
3-25	Ph	H	H	H	H	H	H	Ph	H
3-26	Ph	H	H	H	H	H	H	H	Ph
3-27	Me	Me	H	H	H	H	H	H	H
3-28	Me	Me	H	Me	H	H	H	H	H
3-29	Me	Me	H	H	Me	H	H	H	H
3-30	Me	Me	H	H	H	Me	H	H	H
3-31	Me	Me	H	H	H	H	Me	H	H
3-32	Me	Me	H	H	H	H	H	Me	H
3-33	Me	Me	H	H	H	H	H	H	Me
3-34	Me	Me	H	Ph	H	H	H	H	H
3-35	Me	Me	H	H	Ph	H	H	H	H
3-36	Me	Me	H	H	H	Ph	H	H	H
3-37	Me	Me	H	H	H	H	Ph	H	H
3-38	Me	Me	H	H	H	H	H	Ph	H
3-39	Me	Me	H	H	H	H	H	H	Ph
3-40	Ph	Me	H	H	H	H	H	H	H
3-41	Ph	Me	H	Me	H	H	H	H	H
3-42	Ph	Me	H	H	Me	H	H	H	H
3-43	Ph	Me	H	H	H	Me	H	H	H
3-44	Ph	Me	H	H	H	H	Me	H	H
3-45	Ph	Me	H	H	H	H	H	Me	H
3-46	Ph	Me	H	H	H	H	H	H	Me
3-47	Ph	Me	H	Ph	H	H	H	H	H
3-48	Ph	Me	H	H	Ph	H	H	H	H
3-49	Ph	Me	H	H	H	Ph	H	H	H
3-50	Ph	Me	H	H	H	H	Ph	H	H
3-51	Ph	Me	H	H	H	H	H	Ph	H
3-52	Ph	Me	H	H	H	H	H	H	Ph
3-53	Me	H	Me	H	H	H	H	H	H
3-54	Me	H	Me	Me	H	H	H	H	H
3-55	Me	H	Me	H	Me	H	H	H	H
3-56	Me	H	Me	H	H	Me	H	H	H
3-57	Me	H	Me	H	H	H	Me	H	H
3-58	Me	H	Me	H	H	H	H	Me	H
3-59	Me	H	Me	H	H	H	H	H	Me
3-60	Me	H	Me	Ph	H	H	H	H	H
3-61	Me	H	Me	H	Ph	H	H	H	H
3-62	Me	H	Me	H	H	Ph	H	H	H
3-63	Me	H	Me	H	H	H	Ph	H	H
3-64	Me	H	Me	H	H	H	H	Ph	H
3-65	Me	H	Me	H	H	H	H	H	Ph
3-66	Ph	H	Me	H	H	H	H	H	H
3-67	Ph	H	Me	Me	H	H	H	H	H

TABLE 3-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
3-68	Ph	H	Me	H	Me	H	H	H	H
3-69	Ph	H	Me	H	H	Me	H	H	H
3-70	Ph	H	Me	H	H	H	Me	H	H
3-71	Ph	H	Me	H	H	H	H	Me	H
3-72	Ph	H	Me	H	H	H	H	H	Me
3-73	Ph	H	Me	Ph	H	H	H	H	H
3-74	Ph	H	Me	H	Ph	H	H	H	H
3-75	Ph	H	Me	H	H	Ph	H	H	H
3-76	Ph	H	Me	H	H	H	Ph	H	H
3-77	Ph	H	Me	H	H	H	H	Ph	H
3-78	Ph	H	Me	H	H	H	H	H	Ph
3-79	Me	Ph	H	H	H	H	H	H	H
3-80	Me	Ph	H	Me	H	H	H	H	H
3-81	Me	Ph	H	H	Me	H	H	H	H
3-82	Me	Ph	H	H	H	Me	H	H	H
3-83	Me	Ph	H	H	H	H	Me	H	H
3-84	Me	Ph	H	H	H	H	H	Me	H
3-85	Me	Ph	H	H	H	H	H	H	Me
3-86	Me	Ph	H	Ph	H	H	H	H	H
3-87	Me	Ph	H	H	Ph	H	H	H	H
3-88	Me	Ph	H	H	H	Ph	H	H	H
3-89	Me	Ph	H	H	H	H	Ph	H	H
3-90	Me	Ph	H	H	H	H	H	Ph	H
3-91	Me	Ph	H	H	H	H	H	H	Ph
3-92	Ph	Ph	H	H	H	H	H	H	H
3-93	Ph	Ph	H	Me	H	H	H	H	H
3-94	Ph	Ph	H	H	Me	H	H	H	H
3-95	Ph	Ph	H	H	H	Me	H	H	H
3-96	Ph	Ph	H	H	H	H	Me	H	H
3-97	Ph	Ph	H	H	H	H	H	Me	H
3-98	Ph	Ph	H	H	H	H	H	H	Me
3-99	Ph	Ph	H	Ph	H	H	H	H	H
3-100	Ph	Ph	H	H	Ph	H	H	H	H
3-101	Ph	Ph	H	H	H	Ph	H	H	H
3-102	Ph	Ph	H	H	H	H	Ph	H	H
3-103	Ph	Ph	H	H	H	H	H	Ph	H
3-104	Ph	Ph	H	H	H	H	H	H	Ph
3-105	Me	H	Ph	H	H	H	H	H	H
3-106	Me	H	Ph	Me	H	H	H	H	H
3-107	Me	H	Ph	H	Me	H	H	H	H
3-108	Me	H	Ph	H	H	Me	H	H	H
3-109	Me	H	Ph	H	H	H	Me	H	H
3-110	Me	H	Ph	H	H	H	H	Me	H
3-111	Me	H	Ph	H	H	H	H	H	Me
3-112	Me	H	Ph	Ph	H	H	H	H	H
3-113	Me	H	Ph	H	Ph	H	H	H	H
3-114	Me	H	Ph	H	H	Ph	H	H	H
3-115	Me	H	Ph	H	H	H	Ph	H	H
3-116	Me	H	Ph	H	H	H	H	Ph	H
3-117	Me	H	Ph	H	H	H	H	H	Ph
3-118	Ph	H	Ph	H	H	H	H	H	H
3-119	Ph	H	Ph	Me	H	H	H	H	H
3-120	Ph	H	Ph	H	Me	H	H	H	H
3-121	Ph	H	Ph	H	H	Me	H	H	H
3-122	Ph	H	Ph	H	H	H	Me	H	H
3-123	Ph	H	Ph	H	H	H	H	Me	H
3-124	Ph	H	Ph	H	H	H	H	H	Me
3-125	Ph	H	Ph	Ph	H	H	H	H	H
3-126	Ph	H	Ph	H	Ph	H	H	H	H
3-127	Ph	H	Ph	H	H	Ph	H	H	H
3-128	Ph	H	Ph	H	H	H	Ph	H	H
3-129	Ph	H	Ph	H	H	H	H	Ph	H
3-130	Ph	H	Ph	H	H	H	H	H	Ph

TABLE 4

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
4-2	Me	H	H	Me	H	H	H	H	H	Me
4-3	Me	H	H	H	Me	H	H	H	H	Me
4-4	Me	H	H	H	H	Me	H	H	H	Me
4-5	Me	H	H	H	H	H	Me	H	H	Me
4-6	Me	H	H	H	H	H	H	Me	H	Me
4-7	Me	H	H	H	H	H	H	H	Me	Me

TABLE 4-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
4-8	Me	H	H	Ph	H	H	H	H	H	Me
4-9	Me	H	H	H	Ph	H	H	H	H	Me
4-10	Me	H	H	H	H	Ph	H	H	H	Me
4-11	Me	H	H	H	H	H	Ph	H	H	Me
4-12	Me	H	H	H	H	H	H	Ph	H	Me
4-13	Me	H	H	H	H	H	H	H	Ph	Me
4-14	Ph	H	H	H	H	H	H	H	H	Me
4-15	Ph	H	H	Me	H	H	H	H	H	Me
4-16	Ph	H	H	H	Me	H	H	H	H	Me
4-17	Ph	H	H	H	H	Me	H	H	H	Me
4-18	Ph	H	H	H	H	H	Me	H	H	Me
4-19	Ph	H	H	H	H	H	H	Me	H	Me
4-20	Ph	H	H	H	H	H	H	H	Me	Me
4-21	Ph	H	H	Ph	H	H	H	H	H	Me
4-22	Ph	H	H	H	Ph	H	H	H	H	Me
4-23	Ph	H	H	H	H	Ph	H	H	H	Me
4-24	Ph	H	H	H	H	H	Ph	H	H	Me
4-25	Ph	H	H	H	H	H	H	Ph	H	Me
4-26	Ph	H	H	H	H	H	H	H	Ph	Me
4-27	Me	Me	H	H	H	H	H	H	H	Me
4-28	Me	Me	H	Me	H	H	H	H	H	Me
4-29	Me	Me	H	H	Me	H	H	H	H	Me
4-30	Me	Me	H	H	H	Me	H	H	H	Me
4-31	Me	Me	H	H	H	H	Me	H	H	Me
4-32	Me	Me	H	H	H	H	H	Me	H	Me
4-33	Me	Me	H	H	H	H	H	H	Me	Me
4-34	Me	Me	H	Ph	H	H	H	H	H	Me
4-35	Me	Me	H	H	Ph	H	H	H	H	Me
4-36	Me	Me	H	H	H	Ph	H	H	H	Me
4-37	Me	Me	H	H	H	H	Ph	H	H	Me
4-38	Me	Me	H	H	H	H	H	Ph	H	Me
4-39	Me	Me	H	H	H	H	H	H	Ph	Me
4-40	Ph	Me	H	H	H	H	H	H	H	Me
4-41	Ph	Me	H	Me	H	H	H	H	H	Me
4-42	Ph	Me	H	H	Me	H	H	H	H	Me
4-43	Ph	Me	H	H	H	Me	H	H	H	Me
4-44	Ph	Me	H	H	H	H	Me	H	H	Me
4-45	Ph	Me	H	H	H	H	H	Me	H	Me
4-46	Ph	Me	H	H	H	H	H	H	Me	Me
4-47	Ph	Me	H	Ph	H	H	H	H	H	Me
4-48	Ph	Me	H	H	Ph	H	H	H	H	Me
4-49	Ph	Me	H	H	H	Ph	H	H	H	Me
4-50	Ph	Me	H	H	H	H	Ph	H	H	Me
4-51	Ph	Me	H	H	H	H	H	Ph	H	Me
4-52	Ph	Me	H	H	H	H	H	H	Ph	Me
4-53	Me	H	Me	H	H	H	H	H	H	Me
4-54	Me	H	Me	Me	H	H	H	H	H	Me
4-55	Me	H	Me	H	Me	H	H	H	H	Me
4-56	Me	H	Me	H	H	Me	H	H	H	Me
4-57	Me	H	Me	H	H	H	Me	H	H	Me
4-58	Me	H	Me	H	H	H	H	Me	H	Me
4-59	Me	H	Me	H	H	H	H	H	Me	Me
4-60	Me	H	Me	Ph	H	H	H	H	H	Me
4-61	Me	H	Me	H	Ph	H	H	H	H	Me
4-62	Me	H	Me	H	H	Ph	H	H	H	Me
4-63	Me	H	Me	H	H	H	Ph	H	H	Me
4-64	Me	H	Me	H	H	H	H	Ph	H	Me
4-65	Me	H	Me	H	H	H	H	H	Ph	Me
4-66	Ph	H	Me	H	H	H	H	H	H	Me
4-67	Ph	H	Me	Me	H	H	H	H	H	Me
4-68	Ph	H	Me	H	Me	H	H	H	H	Me
4-69	Ph	H	Me	H	H	Me	H	H	H	Me
4-70	Ph	H	Me	H	H	H	Me	H	H	Me
4-71	Ph	H	Me	H	H	H	H	Me	H	Me
4-72	Ph	H	Me	H	H	H	H	H	Me	Me
4-73	Ph	H	Me	Ph	H	H	H	H	H	Me
4-74	Ph	H	Me	H	Ph	H	H	H	H	Me
4-75	Ph	H	Me	H	H	Ph	H	H	H	Me
4-76	Ph	H	Me	H	H	H	Ph	H	H	Me
4-77	Ph	H	Me	H	H	H	H	Ph	H	Me
4-78	Ph	H	Me	H	H	H	H	H	Ph	Me
4-79	Me	Ph	H	H	H	H	H	H	H	Me
4-80	Me	Ph	H	Me	H	H	H	H	H	Me
4-81	Me	Ph	H	H	Me	H	H	H	H	Me
4-82	Me	Ph	H	H	H	Me	H	H	H	Me
4-83	Me	Ph	H	H	H	H	Me	H	H	Me
4-84	Me	Ph	H	H	H	H	H	Me	H	Me
4-85	Me	Ph	H	H	H	H	H	H	Me	Me

TABLE 4-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
4-86	Me	Ph	H	Ph	H	H	H	H	H	Me
4-87	Me	Ph	H	H	Ph	H	H	H	H	Me
4-88	Me	Ph	H	H	H	Ph	H	H	H	Me
4-89	Me	Ph	H	H	H	H	Ph	H	H	Me
4-90	Me	Ph	H	H	H	H	H	Ph	H	Me
4-91	Me	Ph	H	H	H	H	H	H	Ph	Me
4-92	Ph	Ph	H	H	H	H	H	H	H	Me
4-93	Ph	Ph	H	Me	H	H	H	H	H	Me
4-94	Ph	Ph	H	H	Me	H	H	H	H	Me
4-95	Ph	Ph	H	H	H	Me	H	H	H	Me
4-96	Ph	Ph	H	H	H	H	Me	H	H	Me
4-97	Ph	Ph	H	H	H	H	H	Me	H	Me
4-98	Ph	Ph	H	H	H	H	H	H	Me	Me
4-99	Ph	Ph	H	Ph	H	H	H	H	H	Me
4-100	Ph	Ph	H	H	Ph	H	H	H	H	Me
4-101	Ph	Ph	H	H	H	Ph	H	H	H	Me
4-102	Ph	Ph	H	H	H	H	Ph	H	H	Me
4-103	Ph	Ph	H	H	H	H	H	Ph	H	Me
4-104	Ph	Ph	H	H	H	H	H	H	Ph	Me
4-105	Me	H	Ph	H	H	H	H	H	H	Me
4-106	Me	H	Ph	Me	H	H	H	H	H	Me
4-107	Me	H	Ph	H	Me	H	H	H	H	Me
4-108	Me	H	Ph	H	H	Me	H	H	H	Me
4-109	Me	H	Ph	H	H	H	Me	H	H	Me
4-110	Me	H	Ph	H	H	H	H	Me	H	Me
4-111	Me	H	Ph	H	H	H	H	H	Me	Me
4-112	Me	H	Ph	Ph	H	H	H	H	H	Me
4-113	Me	H	Ph	H	Ph	H	H	H	H	Me
4-114	Me	H	Ph	H	H	Ph	H	H	H	Me
4-115	Me	H	Ph	H	H	H	Ph	H	H	Me
4-116	Me	H	Ph	H	H	H	H	Ph	H	Me
4-117	Me	H	Ph	H	H	H	H	H	Ph	Me
4-118	Ph	H	Ph	H	H	H	H	H	H	Me
4-119	Ph	H	Ph	Me	H	H	H	H	H	Me
4-120	Ph	H	Ph	H	Me	H	H	H	H	Me
4-121	Ph	H	Ph	H	H	Me	H	H	H	Me
4-122	Ph	H	Ph	H	H	H	Me	H	H	Me
4-123	Ph	H	Ph	H	H	H	H	Me	H	Me
4-124	Ph	H	Ph	H	H	H	H	H	Me	Me
4-125	Ph	H	Ph	Ph	H	H	H	H	H	Me
4-126	Ph	H	Ph	H	Ph	H	H	H	H	Me
4-127	Ph	H	Ph	H	H	Ph	H	H	H	Me
4-128	Ph	H	Ph	H	H	H	Ph	H	H	Me
4-129	Ph	H	Ph	H	H	H	H	Ph	H	Me
4-130	Ph	H	Ph	H	H	H	H	H	Ph	Me

TABLE 5

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
5-1	Me	H	H	H	H	H	H	H	H	H	H
5-2	Me	H	H	Me	H	H	H	H	H	H	H
5-3	Me	H	H	H	Me	H	H	H	H	H	H
5-4	Me	H	H	H	H	Me	H	H	H	H	H
5-5	Me	H	H	H	H	H	Me	H	H	H	H
5-6	Me	H	H	H	H	H	H	Me	H	H	H
5-7	Me	H	H	H	H	H	H	H	Me	H	H
5-8	Me	H	H	H	H	H	H	H	H	Me	H
5-9	Me	H	H	H	H	H	H	H	H	H	Me
5-10	Me	H	H	Ph	H	H	H	H	H	H	H
5-11	Me	H	H	H	Ph	H	H	H	H	H	H
5-12	Me	H	H	H	H	Ph	H	H	H	H	H
5-13	Me	H	H	H	H	H	Ph	H	H	H	H
5-14	Me	H	H	H	H	H	H	Ph	H	H	H
5-15	Me	H	H	H	H	H	H	H	Ph	H	H
5-16	Me	H	H	H	H	H	H	H	H	Ph	H
5-17	Me	H	H	H	H	H	H	H	H	H	Ph
5-18	Ph	H	H	H	H	H	H	H	H	H	H
5-19	Ph	H	H	Me	H	H	H	H	H	H	H
5-20	Ph	H	H	H	Me	H	H	H	H	H	H
5-21	Ph	H	H	H	H	Me	H	H	H	H	H
5-22	Ph	H	H	H	H	H	Me	H	H	H	H
5-23	Ph	H	H	H	H	H	H	Me	H	H	H
5-24	Ph	H	H	H	H	H	H	H	Me	H	H
5-25	Ph	H	H	H	H	H	H	H	H	Me	H

TABLE 5-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
5-26	Ph	H	H	H	H	H	H	H	H	H	Me
5-27	Ph	H	H	Ph	H	H	H	H	H	H	H
5-28	Ph	H	H	H	Ph	H	H	H	H	H	H
5-29	Ph	H	H	H	H	Ph	H	H	H	H	H
5-30	Ph	H	H	H	H	H	Ph	H	H	H	H
5-31	Ph	H	H	H	H	H	H	Ph	H	H	H
5-32	Ph	H	H	H	H	H	H	H	Ph	H	H
5-33	Ph	H	H	H	H	H	H	H	H	Ph	H
5-34	Ph	H	H	H	H	H	H	H	H	H	Ph
5-35	Me	Me	H	H	H	H	H	H	H	H	H
5-36	Me	Me	H	Me	H	H	H	H	H	H	H
5-37	Me	Me	H	H	Me	H	H	H	H	H	H
5-38	Me	Me	H	H	H	Me	H	H	H	H	H
5-39	Me	Me	H	H	H	H	Me	H	H	H	H
5-40	Me	Me	H	H	H	H	H	Me	H	H	H
5-41	Me	Me	H	H	H	H	H	H	Me	H	H
5-42	Me	Me	H	H	H	H	H	H	H	Me	H
5-43	Me	Me	H	H	H	H	H	H	H	H	Me
5-44	Me	Me	H	Ph	H	H	H	H	H	H	H
5-45	Me	Me	H	H	Ph	H	H	H	H	H	H
5-46	Me	Me	H	H	H	Ph	H	H	H	H	H
5-47	Me	Me	H	H	H	H	Ph	H	H	H	H
5-48	Me	Me	H	H	H	H	H	Ph	H	H	H
5-49	Me	Me	H	H	H	H	H	H	Ph	H	H
5-50	Me	Me	H	H	H	H	H	H	H	Ph	H
5-51	Me	Me	H	H	H	H	H	H	H	H	Ph
5-52	Ph	Me	H	H	H	H	H	H	H	H	H
5-53	Ph	Me	H	Me	H	H	H	H	H	H	H
5-54	Ph	Me	H	H	Me	H	H	H	H	H	H
5-55	Ph	Me	H	H	H	Me	H	H	H	H	H
5-56	Ph	Me	H	H	H	H	Me	H	H	H	H
5-57	Ph	Me	H	H	H	H	H	Me	H	H	H
5-58	Ph	Me	H	H	H	H	H	H	Me	H	H
5-59	Ph	Me	H	H	H	H	H	H	H	Me	H
5-60	Ph	Me	H	H	H	H	H	H	H	H	Me
5-61	Ph	Me	H	Ph	H	H	H	H	H	H	H
5-62	Ph	Me	H	H	Ph	H	H	H	H	H	H
5-63	Ph	Me	H	H	H	Ph	H	H	H	H	H
5-64	Ph	Me	H	H	H	H	Ph	H	H	H	H
5-65	Ph	Me	H	H	H	H	H	Ph	H	H	H
5-66	Ph	Me	H	H	H	H	H	H	Ph	H	H
5-67	Ph	Me	H	H	H	H	H	H	H	Ph	H
5-68	Ph	Me	H	H	H	H	H	H	H	H	Ph
5-69	Me	H	Me	H	H	H	H	H	H	H	H
5-70	Me	H	Me	Me	H	H	H	H	H	H	H
5-71	Me	H	Me	H	Me	H	H	H	H	H	H
5-72	Me	H	Me	H	H	Me	H	H	H	H	H
5-73	Me	H	Me	H	H	H	Me	H	H	H	H
5-74	Me	H	Me	H	H	H	H	Me	H	H	H
5-75	Me	H	Me	H	H	H	H	H	Me	H	H
5-76	Me	H	Me	H	H	H	H	H	H	Me	H
5-77	Me	H	Me	H	H	H	H	H	H	H	Me
5-78	Me	H	Me	Ph	H	H	H	H	H	H	H
5-79	Me	H	Me	H	Ph	H	H	H	H	H	H
5-80	Me	H	Me	H	H	Ph	H	H	H	H	H
5-81	Me	H	Me	H	H	H	Ph	H	H	H	H
5-82	Me	H	Me	H	H	H	H	Ph	H	H	H
5-83	Me	H	Me	H	H	H	H	H	Ph	H	H
5-84	Me	H	Me	H	H	H	H	H	H	Ph	H
5-85	Me	H	Me	H	H	H	H	H	H	H	Ph
5-86	Ph	H	Me	H	H	H	H	H	H	H	H
5-87	Ph	H	Me	Me	H	H	H	H	H	H	H
5-88	Ph	H	Me	H	Me	H	H	H	H	H	H
5-89	Ph	H	Me	H	H	Me	H	H	H	H	H
5-90	Ph	H	Me	H	H	H	Me	H	H	H	H
5-91	Ph	H	Me	H	H	H	H	Me	H	H	H
5-92	Ph	H	Me	H	H	H	H	H	Me	H	H
5-93	Ph	H	Me	H	H	H	H	H	H	Me	H
5-94	Ph	H	Me	H	H	H	H	H	H	H	Me
5-95	Ph	H	Me	Ph	H	H	H	H	H	H	H
5-96	Ph	H	Me	H	Ph	H	H	H	H	H	H
5-97	Ph	H	Me	H	H	Ph	H	H	H	H	H
5-98	Ph	H	Me	H	H	H	Ph	H	H	H	H
5-99	Ph	H	Me	H	H	H	H	Ph	H	H	H
5-100	Ph	H	Me	H	H	H	H	H	Ph	H	H
5-101	Ph	H	Me	H	H	H	H	H	H	Ph	H
5-102	Ph	H	Me	H	H	H	H	H	H	H	Ph
5-103	Me	Ph	H	H	H	H	H	H	H	H	H

TABLE 5-continued

Cpd No.	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
5-104	Me	Ph	H	Me	H	H	H	H	H	H	H
5-105	Me	Ph	H	H	Me	H	H	H	H	H	H
5-106	Me	Ph	H	H	H	Me	H	H	H	H	H
5-107	Me	Ph	H	H	H	H	Me	H	H	H	H
5-108	Me	Ph	H	H	H	H	H	Me	H	H	H
5-109	Me	Ph	H	H	H	H	H	H	Me	H	H
5-110	Me	Ph	H	H	H	H	H	H	H	Me	H
5-111	Me	Ph	H	H	H	H	H	H	H	H	Me
5-112	Me	Ph	H	Ph	H	H	H	H	H	H	H
5-113	Me	Ph	H	H	Ph	H	H	H	H	H	H
5-114	Me	Ph	H	H	H	Ph	H	H	H	H	H
5-115	Me	Ph	H	H	H	H	Ph	H	H	H	H
5-116	Me	Ph	H	H	H	H	H	Ph	H	H	H
5-117	Me	Ph	H	H	H	H	H	H	Ph	H	H
5-118	Me	Ph	H	H	H	H	H	H	H	Ph	H
5-119	Me	Ph	H	H	H	H	H	H	H	H	Ph
5-120	Ph	Ph	H	H	H	H	H	H	H	H	H
5-121	Ph	Ph	H	Me	H	H	H	H	H	H	H
5-122	Ph	Ph	H	H	Me	H	H	H	H	H	H
5-123	Ph	Ph	H	H	H	Me	H	H	H	H	H
5-124	Ph	Ph	H	H	H	H	Me	H	H	H	H
5-125	Ph	Ph	H	H	H	H	H	Me	H	H	H
5-126	Ph	Ph	H	H	H	H	H	H	Me	H	H
5-127	Ph	Ph	H	H	H	H	H	H	H	Me	H
5-128	Ph	Ph	H	H	H	H	H	H	H	H	Me
5-129	Ph	Ph	H	Ph	H	H	H	H	H	H	H
5-130	Ph	Ph	H	H	Ph	H	H	H	H	H	H
5-131	Ph	Ph	H	H	H	Ph	H	H	H	H	H
5-132	Ph	Ph	H	H	H	H	Ph	H	H	H	H
5-133	Ph	Ph	H	H	H	H	H	Ph	H	H	H
5-134	Ph	Ph	H	H	H	H	H	H	Ph	H	H
5-135	Ph	Ph	H	H	H	H	H	H	H	Ph	H
5-136	Ph	Ph	H	H	H	H	H	H	H	H	Ph
5-137	Me	H	Ph	H	H	H	H	H	H	H	H
5-138	Me	H	Ph	Me	H	H	H	H	H	H	H
5-139	Me	H	Ph	H	Me	H	H	H	H	H	H
5-140	Me	H	Ph	H	H	Me	H	H	H	H	H
5-141	Me	H	Ph	H	H	H	Me	H	H	H	H
5-142	Me	H	Ph	H	H	H	H	Me	H	H	H
5-143	Me	H	Ph	H	H	H	H	H	Me	H	H
5-144	Me	H	Ph	H	H	H	H	H	H	Me	H
5-145	Me	H	Ph	H	H	H	H	H	H	H	Me
5-146	Me	H	Ph	Ph	H	H	H	H	H	H	H
5-147	Me	H	Ph	H	Ph	H	H	H	H	H	H
5-148	Me	H	Ph	H	H	Ph	H	H	H	H	H
5-149	Me	H	Ph	H	H	H	Ph	H	H	H	H
5-150	Me	H	Ph	H	H	H	H	Ph	H	H	H
5-151	Me	H	Ph	H	H	H	H	H	Ph	H	H
5-152	Me	H	Ph	H	H	H	H	H	H	Ph	H
5-153	Me	H	Ph	H	H	H	H	H	H	H	Ph
5-154	Ph	H	Ph	H	H	H	H	H	H	H	H
5-155	Ph	H	Ph	Me	H	H	H	H	H	H	H
5-156	Ph	H	Ph	H	Me	H	H	H	H	H	H
5-157	Ph	H	Ph	H	H	Me	H	H	H	H	H
5-158	Ph	H	Ph	H	H	H	Me	H	H	H	H
5-159	Ph	H	Ph	H	H	H	H	Me	H	H	H
5-160	Ph	H	Ph	H	H	H	H	H	Me	H	H
5-161	Ph	H	Ph	H	H	H	H	H	H	Me	H
5-162	Ph	H	Ph	H	H	H	H	H	H	H	Me
5-163	Ph	H	Ph	Ph	H	H	H	H	H	H	H
5-164	Ph	H	Ph	H	Ph	H	H	H	H	H	H
5-165	Ph	H	Ph	H	H	Ph	H	H	H	H	H
5-166	Ph	H	Ph	H	H	H	Ph	H	H	H	H
5-167	Ph	H	Ph	H	H	H	H	Ph	H	H	H
5-168	Ph	H	Ph	H	H	H	H	H	Ph	H	H
5-169	Ph	H	Ph	H	H	H	H	H	H	Ph	H
5-170	Ph	H	Ph	H	H	H	H	H	H	H	Ph

TABLE 6

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2
6-1	Me	H	H	H	H	H
6-2	Me	H	H	H	Me	H

TABLE 6-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2
6-3	Me	H	H	H	H	Me
6-4	Me	H	H	H	Ph	H

E-chem of fac-$(tpy)_2Ir$(1-Ph-3-Me-imid) in DMF w/0.1M $Bu_4N^+PF_6^-$

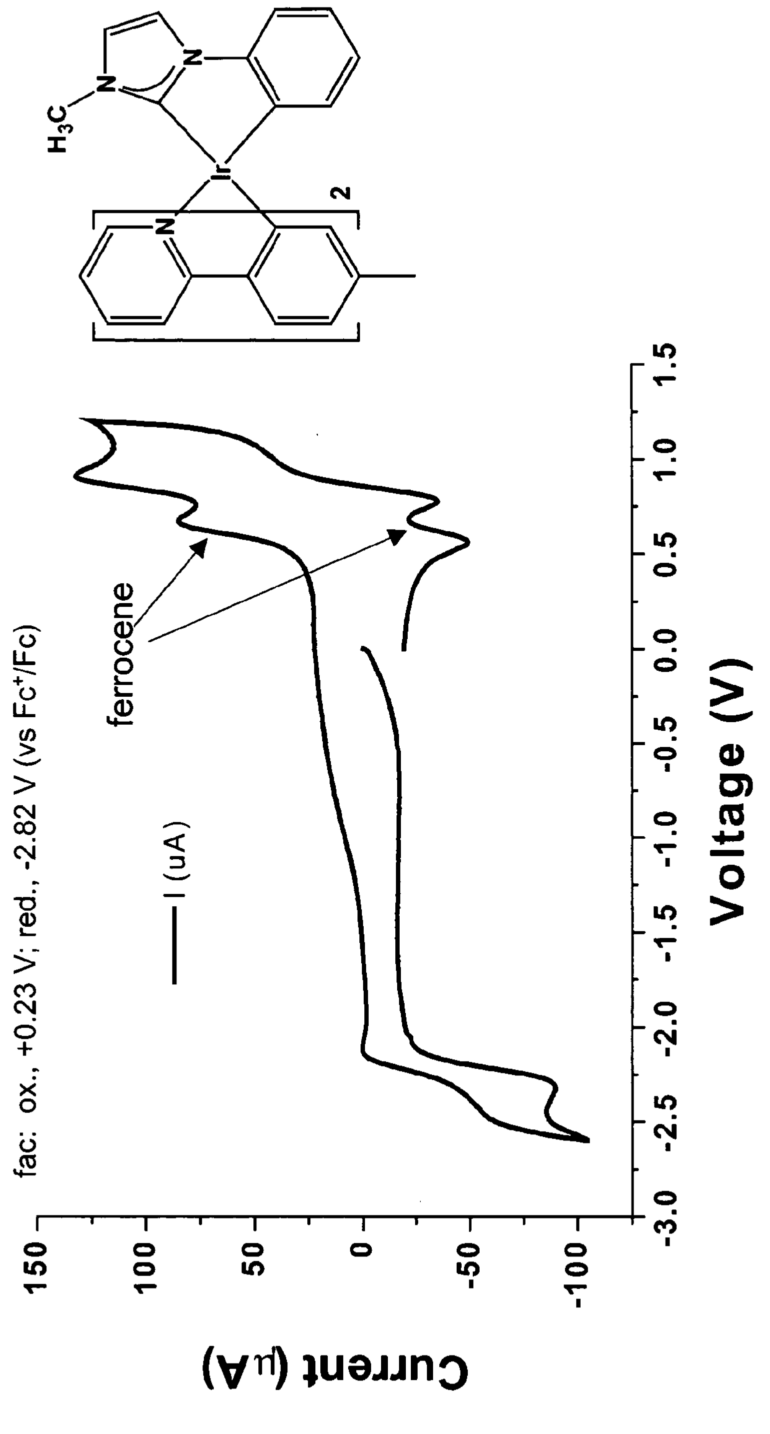


Figure 7

TABLE 6-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2
6-5	Me	H	H	H	H	Ph
6-6	Ph	H	H	H	H	H
6-7	Ph	H	H	H	Me	H
6-8	Ph	H	H	H	H	Me
6-9	Ph	H	H	H	Ph	H
6-10	Ph	H	H	H	H	Ph
6-11	Me	Me	H	H	H	H
6-12	Me	Me	H	H	Me	H
6-13	Me	Me	H	H	H	Me
6-14	Me	Me	H	H	Ph	H
6-15	Me	Me	H	H	H	Ph
6-16	Ph	Me	H	H	H	H
6-17	Ph	Me	H	H	Me	H
6-18	Ph	Me	H	H	H	Me
6-19	Ph	Me	H	H	Ph	H
6-20	Ph	Me	H	H	H	Ph
6-21	Me	H	Me	H	H	H
6-22	Me	H	Me	H	Me	H
6-23	Me	H	Me	H	H	Me
6-24	Me	H	Me	H	Ph	H
6-25	Me	H	Me	H	H	Ph
6-26	Ph	H	Me	H	H	H
6-27	Ph	H	Me	H	Me	H
6-28	Ph	H	Me	H	H	Me
6-29	Ph	H	Me	H	Ph	H
6-30	Ph	H	Me	H	H	Ph
6-31	Me	H	H	Me	H	H
6-32	Me	H	H	Me	Me	H
6-33	Me	H	H	Me	H	Me
6-34	Me	H	H	Me	Ph	H
6-35	Me	H	H	Me	H	Ph
6-36	Ph	H	H	Me	H	H
6-37	Ph	H	H	Me	Me	H
6-38	Ph	H	H	Me	H	Me
6-39	Ph	H	H	Me	Ph	H
6-40	Ph	H	H	Me	H	Ph
6-41	Me	Ph	H	H	H	H
6-42	Me	Ph	H	H	Me	H
6-43	Me	Ph	H	H	H	Me
6-44	Me	Ph	H	H	Ph	H
6-45	Me	Ph	H	H	H	Ph
6-46	Ph	Ph	H	H	H	H
6-47	Ph	Ph	H	H	Me	H
6-48	Ph	Ph	H	H	H	Me
6-49	Ph	Ph	H	H	Ph	H
6-50	Ph	Ph	H	H	H	Ph
6-51	Me	H	Ph	H	H	H
6-52	Me	H	Ph	H	Me	H
6-53	Me	H	Ph	H	H	Me
6-54	Me	H	Ph	H	Ph	H
6-55	Me	H	Ph	H	H	Ph
6-56	Ph	H	Ph	H	H	H
6-57	Ph	H	Ph	H	Me	H
6-58	Ph	H	Ph	H	H	Me
6-59	Ph	H	Ph	H	Ph	H
6-60	Ph	H	Ph	H	H	Ph
6-61	Me	H	H	Ph	H	H
6-62	Me	H	H	Ph	Me	H
6-63	Me	H	H	Ph	H	Me
6-64	Me	H	H	Ph	Ph	H
6-65	Me	H	H	Ph	H	Ph
6-66	Ph	H	H	Ph	H	H
6-67	Ph	H	H	Ph	Me	H
6-68	Ph	H	H	Ph	H	Me
6-69	Ph	H	H	Ph	Ph	H
6-70	Ph	H	H	Ph	H	Ph

TABLE 7

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4
7-1	Me	H	H	H	H	H	H	H
7-2	Me	H	H	H	Me	H	H	H
7-3	Me	H	H	H	H	Me	H	H

TABLE 7-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4
7-4	Me	H	H	H	H	H	Me	H
7-5	Me	H	H	H	H	H	H	Me
7-6	Me	H	H	H	Ph	H	H	H
7-7	Me	H	H	H	H	Ph	H	H
7-8	Me	H	H	H	H	H	Ph	H
7-9	Me	H	H	H	H	H	H	Ph
7-10	Ph	H	H	H	H	H	H	H
7-11	Ph	H	H	H	Me	H	H	H
7-12	Ph	H	H	H	H	Me	H	H
7-13	Ph	H	H	H	H	H	Me	H
7-14	Ph	H	H	H	H	H	H	Me
7-15	Ph	H	H	H	Ph	H	H	H
7-16	Ph	H	H	H	H	Ph	H	H
7-17	Ph	H	H	H	H	H	Ph	H
7-18	Ph	H	H	H	H	H	H	Ph
7-19	Me	Me	H	H	H	H	H	H
7-20	Me	Me	H	H	Me	H	H	H
7-21	Me	Me	H	H	H	Me	H	H
7-22	Me	Me	H	H	H	H	Me	H
7-23	Me	Me	H	H	H	H	H	Me
7-24	Me	Me	H	H	Ph	H	H	H
7-25	Me	Me	H	H	H	Ph	H	H
7-26	Me	Me	H	H	H	H	Ph	H
7-27	Me	Me	H	H	H	H	H	Ph
7-28	Ph	Me	H	H	H	H	H	H
7-29	Ph	Me	H	H	Me	H	H	H
7-30	Ph	Me	H	H	H	Me	H	H
7-31	Ph	Me	H	H	H	H	Me	H
7-32	Ph	Me	H	H	H	H	H	Me
7-33	Ph	Me	H	H	Ph	H	H	H
7-34	Ph	Me	H	H	H	Ph	H	H
7-35	Ph	Me	H	H	H	H	Ph	H
7-36	Ph	Me	H	H	H	H	H	Ph
7-37	Me	H	Me	H				
7-38	Me	H	Me	H	Me	H	H	H
7-39	Me	H	Me	H	H	Me	H	H
7-40	Me	H	Me	H	H	H	Me	H
7-41	Me	H	Me	H	H	H	H	Me
7-42	Me	H	Me	H	Ph	H	H	H
7-43	Me	H	Me	H	H	Ph	H	H
7-44	Me	H	Me	H	H	H	Ph	H
7-45	Me	H	Me	H	H	H	H	Ph
7-46	Ph	H	Me	H	H	H	H	H
7-47	Ph	H	Me	H	Me	H	H	H
7-48	Ph	H	Me	H	H	Me	H	H
7-49	Ph	H	Me	H	H	H	Me	H
7-50	Ph	H	Me	H	H	H	H	Me
7-51	Ph	H	Me	H	Ph	H	H	H
7-52	Ph	H	Me	H	H	Ph	H	H
7-53	Ph	H	Me	H	H	H	Ph	H
7-54	Ph	H	Me	H	H	H	H	Ph
7-55	Me	H	H	Me				
7-56	Me	H	H	Me	Me	H	H	H
7-57	Me	H	H	Me	H	Me	H	H
7-58	Me	H	H	Me	H	H	Me	H
7-59	Me	H	H	Me	H	H	H	Me
7-60	Me	H	H	Me	Ph	H	H	H
7-61	Me	H	H	Me	H	Ph	H	H
7-62	Me	H	H	Me	H	H	Ph	H
7-63	Me	H	H	Me	H	H	H	Ph
7-64	Ph	H	H	Me	H	H	H	H
7-65	Ph	H	H	Me	Me	H	H	H
7-66	Ph	H	H	Me	H	Me	H	H
7-67	Ph	H	H	Me	H	H	Me	H
7-68	Ph	H	H	Me	H	H	H	Me
7-69	Ph	H	H	Me	Ph	H	H	H
7-70	Ph	H	H	Me	H	Ph	H	H
7-71	Ph	H	H	Me	H	H	Ph	H
7-72	Ph	H	H	Me	H	H	H	Ph
7-73	Me	Ph	H	H	H	H	H	H
7-74	Me	Ph	H	H	Me	H	H	H
7-75	Me	Ph	H	H	H	Me	H	H
7-76	Me	Ph	H	H	H	H	Me	H
7-77	Me	Ph	H	H	H	H	H	Me
7-78	Me	Ph	H	H	Ph	H	H	H
7-79	Me	Ph	H	H	H	Ph	H	H
7-80	Me	Ph	H	H	H	H	Ph	H
7-81	Me	Ph	H	H	H	H	H	Ph

TABLE 7-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4
7-82	Ph	Ph	H	H	H	H	H	H
7-83	Ph	Ph	H	H	Me	H	H	H
7-84	Ph	Ph	H	H	H	Me	H	H
7-85	Ph	Ph	H	H	H	H	Me	H
7-86	Ph	Ph	H	H	H	H	H	Me
7-87	Ph	Ph	H	H	Ph	H	H	H
7-88	Ph	Ph	H	H	H	Ph	H	H
7-89	Ph	Ph	H	H	H	H	Ph	H
7-90	Ph	Ph	H	H	H	H	H	Ph
7-91	Me	H	Ph	H	H	H	H	H
7-92	Me	H	Ph	H	Me	H	H	H
7-93	Me	H	Ph	H	H	Me	H	H
7-94	Me	H	Ph	H	H	H	Me	H
7-95	Me	H	Ph	H	H	H	H	Me
7-96	Me	H	Ph	H	Ph	H	H	H
7-97	Me	H	Ph	H	H	Ph	H	H
7-98	Me	H	Ph	H	H	H	Ph	H
7-99	Me	H	Ph	H	H	H	H	Ph
7-100	Ph	H	Ph	H	H	H	H	H
7-101	Ph	H	Ph	H	Me	H	H	H
7-102	Ph	H	Ph	H	H	Me	H	H
7-103	Ph	H	Ph	H	H	H	Me	H
7-104	Ph	H	Ph	H	H	H	H	Me
7-105	Ph	H	Ph	H	Ph	H	H	H
7-106	Ph	H	Ph	H	H	Ph	H	H
7-107	Ph	H	Ph	H	H	H	Ph	H
7-108	Ph	H	Ph	H	H	H	H	Ph
7-109	Me	H	H	Ph	H	H	H	H
7-110	Me	H	H	Ph	Me	H	H	H
7-111	Me	H	H	Ph	H	Me	H	H
7-112	Me	H	H	Ph	H	H	Me	H
7-113	Me	H	H	Ph	H	H	H	Me
7-114	Me	H	H	Ph	Ph	H	H	H
7-115	Me	H	H	Ph	H	Ph	H	H
7-116	Me	H	H	Ph	H	H	Ph	H
7-117	Me	H	H	Ph	H	H	H	Ph
7-118	Ph	H	H	Ph	H	H	H	H
7-119	Ph	H	H	Ph	Me	H	H	H
7-120	Ph	H	H	Ph	H	Me	H	H
7-121	Ph	H	H	Ph	H	H	Me	H
7-122	Ph	H	H	Ph	H	H	H	Me
7-123	Ph	H	H	Ph	Ph	H	H	H
7-124	Ph	H	H	Ph	H	Ph	H	H
7-125	Ph	H	H	Ph	H	H	Ph	H
7-126	Ph	H	H	Ph	H	H	H	Ph

TABLE 8

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
8-1	Me	H	H	H	H	H	H	H	H	H
8-2	Me	H	H	H	Me	H	H	H	H	H
8-3	Me	H	H	H	H	Me	H	H	H	H
8-4	Me	H	H	H	H	H	Me	H	H	H
8-5	Me	H	H	H	H	H	H	Me	H	H
8-6	Me	H	H	H	H	H	H	H	Me	H
8-7	Me	H	H	H	H	H	H	H	H	Me
8-8	Me	H	H	H	Ph	H	H	H	H	H
8-9	Me	H	H	H	H	Ph	H	H	H	H
8-10	Me	H	H	H	H	H	Ph	H	H	H
8-11	Me	H	H	H	H	H	H	Ph	H	H
8-12	Me	H	H	H	H	H	H	H	Ph	H
8-13	Me	H	H	H	H	H	H	H	H	Ph
8-14	Ph	H	H	H	H	H	H	H	H	H
8-15	Ph	H	H	H	Me	H	H	H	H	H
8-16	Ph	H	H	H	H	Me	H	H	H	H
8-17	Ph	H	H	H	H	H	Me	H	H	H
8-18	Ph	H	H	H	H	H	H	Me	H	H
8-19	Ph	H	H	H	H	H	H	H	Me	H
8-20	Ph	H	H	H	H	H	H	H	H	Me
8-21	Ph	H	H	H	Ph	H	H	H	H	H
8-22	Ph	H	H	H	H	Ph	H	H	H	H
8-23	Ph	H	H	H	H	H	Ph	H	H	H
8-24	Ph	H	H	H	H	H	H	Ph	H	H
8-25	Ph	H	H	H	H	H	H	H	Ph	H
8-26	Ph	H	H	H	H	H	H	H	H	Ph
8-27	Me	Me	H	H	H	H	H	H	H	H
8-28	Me	Me	H	H	Me	H	H	H	H	H
8-29	Me	Me	H	H	H	Me	H	H	H	H
8-30	Me	Me	H	H	H	H	Me	H	H	H
8-31	Me	Me	H	H	H	H	H	Me	H	H
8-32	Me	Me	H	H	H	H	H	H	Me	H
8-33	Me	Me	H	H	H	H	H	H	H	Me
8-34	Me	Me	H	H	Ph	H	H	H	H	H
8-35	Me	Me	H	H	H	Ph	H	H	H	H
8-36	Me	Me	H	H	H	H	Ph	H	H	H
8-37	Me	Me	H	H	H	H	H	Ph	H	H
8-38	Me	Me	H	H	H	H	H	H	Ph	H
8-39	Me	Me	H	H	H	H	H	H	H	Ph
8-40	Ph	Me	H	H	H	H	H	H	H	H
8-41	Ph	Me	H	H	Me	H	H	H	H	H
8-42	Ph	Me	H	H	H	Me	H	H	H	H
8-43	Ph	Me	H	H	H	H	Me	H	H	H
8-44	Ph	Me	H	H	H	H	H	Me	H	H
8-45	Ph	Me	H	H	H	H	H	H	Me	H
8-46	Ph	Me	H	H	H	H	H	H	H	Me
8-47	Ph	Me	H	H	Ph	H	H	H	H	H
8-48	Ph	Me	H	H	H	Ph	H	H	H	H

TABLE 8-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
8-49	Ph	Me	H	H	H	H	Ph	H	H	H
8-50	Ph	Me	H	H	H	H	H	Ph	H	H
8-51	Ph	Me	H	H	H	H	H	H	Ph	H
8-52	Ph	Me	H	H	H	H	H	H	H	Ph
8-53	Me	H	Me	H	H	H	H	H	H	H
8-54	Me	H	Me	H	Me	H	H	H	H	H
8-55	Me	H	Me	H	H	Me	H	H	H	H
8-56	Me	H	Me	H	H	H	Me	H	H	H
8-57	Me	H	Me	H	H	H	H	Me	H	H
8-58	Me	H	Me	H	H	H	H	H	Me	H
8-59	Me	H	Me	H	H	H	H	H	H	Me
8-60	Me	H	Me	H	Ph	H	H	H	H	H
8-61	Me	H	Me	H	H	Ph	H	H	H	H
8-62	Me	H	Me	H	H	H	Ph	H	H	H
8-63	Me	H	Me	H	H	H	H	Ph	H	H
8-64	Me	H	Me	H	H	H	H	H	Ph	H
8-65	Me	H	Me	H	H	H	H	H	H	Ph
8-66	Ph	H	Me	H	H	H	H	H	H	H
8-67	Ph	H	Me	H	Me	H	H	H	H	H
8-68	Ph	H	Me	H	H	Me	H	H	H	H
8-69	Ph	H	Me	H	H	H	Me	H	H	H
8-70	Ph	H	Me	H	H	H	H	Me	H	H
8-71	Ph	H	Me	H	H	H	H	H	Me	H
8-72	Ph	H	Me	H	H	H	H	H	H	Me
8-73	Ph	H	Me	H	Ph	H	H	H	H	H
8-74	Ph	H	Me	H	H	Ph	H	H	H	H
8-75	Ph	H	Me	H	H	H	Ph	H	H	H
8-76	Ph	H	Me	H	H	H	H	Ph	H	H
8-77	Ph	H	Me	H	H	H	H	H	Ph	H
8-78	Ph	H	Me	H	H	H	H	H	H	Ph
8-79	Me	H	H	Me	H	H	H	H	H	H
8-80	Me	H	H	Me	Me	H	H	H	H	H
8-81	Me	H	H	Me	H	Me	H	H	H	H
8-82	Me	H	H	Me	H	H	Me	H	H	H
8-83	Me	H	H	Me	H	H	H	Me	H	H
8-84	Me	H	H	Me	H	H	H	H	Me	H
8-85	Me	H	H	Me	H	H	H	H	H	Me
8-86	Me	H	H	Me	Ph	H	H	H	H	H
8-87	Me	H	H	Me	H	Ph	H	H	H	H
8-88	Me	H	H	Me	H	H	Ph	H	H	H
8-89	Me	H	H	Me	H	H	H	Ph	H	H
8-90	Me	H	H	Me	H	H	H	H	Ph	H
8-91	Me	H	H	Me	H	H	H	H	H	Ph
8-92	Ph	H	H	Me	H	H	H	H	H	H
8-93	Ph	H	H	Me	Me	H	H	H	H	H
8-94	Ph	H	H	Me	H	Me	H	H	H	H
8-95	Ph	H	H	Me	H	H	Me	H	H	H
8-96	Ph	H	H	Me	H	H	H	Me	H	H
8-97	Ph	H	H	Me	H	H	H	H	Me	H
8-98	Ph	H	H	Me	H	H	H	H	H	Me
8-99	Ph	H	H	Me	Ph	H	H	H	H	H
8-100	Ph	H	H	Me	H	Ph	H	H	H	H
8-101	Ph	H	H	Me	H	H	Ph	H	H	H
8-102	Ph	H	H	Me	H	H	H	Ph	H	H
8-103	Ph	H	H	Me	H	H	H	H	Ph	H
8-104	Ph	H	H	Me	H	H	H	H	H	Ph
8-105	Me	Ph	H	H	H	H	H	H	H	H
8-106	Me	Ph	H	H	Me	H	H	H	H	H
8-107	Me	Ph	H	H	H	Me	H	H	H	H
8-108	Me	Ph	H	H	H	H	Me	H	H	H
8-109	Me	Ph	H	H	H	H	H	Me	H	H
8-110	Me	Ph	H	H	H	H	H	H	Me	H
8-111	Me	Ph	H	H	H	H	H	H	H	Me
8-112	Me	Ph	H	H	Ph	H	H	H	H	H
8-113	Me	Ph	H	H	H	Ph	H	H	H	H
8-114	Me	Ph	H	H	H	H	Ph	H	H	H
8-115	Me	Ph	H	H	H	H	H	Ph	H	H
8-116	Me	Ph	H	H	H	H	H	H	Ph	H
8-117	Me	Ph	H	H	H	H	H	H	H	Ph
8-118	Ph	Ph	H	H	H	H	H	H	H	H
8-119	Ph	Ph	H	H	Me	H	H	H	H	H
8-120	Ph	Ph	H	H	H	Me	H	H	H	H
8-121	Ph	Ph	H	H	H	H	Me	H	H	H
8-122	Ph	Ph	H	H	H	H	H	Me	H	H
8-123	Ph	Ph	H	H	H	H	H	H	Me	H
8-124	Ph	Ph	H	H	H	H	H	H	H	Me
8-125	Ph	Ph	H	H	Ph	H	H	H	H	H
8-126	Ph	Ph	H	H	H	Ph	H	H	H	H

TABLE 8-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
8-127	Ph	Ph	H	H	H	H	Ph	H	H	H
8-128	Ph	Ph	H	H	H	H	H	Ph	H	H
8-129	Ph	Ph	H	H	H	H	H	H	Ph	H
8-130	Ph	Ph	H	H	H	H	H	H	H	Ph
8-131	Me	H	Ph	H	H	H	H	H	H	H
8-132	Me	H	Ph	H	Me	H	H	H	H	H
8-133	Me	H	Ph	H	H	Me	H	H	H	H
8-134	Me	H	Ph	H	H	H	Me	H	H	H
8-135	Me	H	Ph	H	H	H	H	Me	H	H
8-136	Me	H	Ph	H	H	H	H	H	Me	H
8-137	Me	H	Ph	H	H	H	H	H	H	Me
8-138	Me	H	Ph	H	Ph	H	H	H	H	H
8-139	Me	H	Ph	H	H	Ph	H	H	H	H
8-140	Me	H	Ph	H	H	H	Ph	H	H	H
8-141	Me	H	Ph	H	H	H	H	Ph	H	H
8-142	Me	H	Ph	H	H	H	H	H	Ph	H
8-143	Me	H	Ph	H	H	H	H	H	H	Ph
8-144	Ph	H	Ph	H	H	H	H	H	H	H
8-145	Ph	H	Ph	H	Me	H	H	H	H	H
8-146	Ph	H	Ph	H	H	Me	H	H	H	H
8-147	Ph	H	Ph	H	H	H	Me	H	H	H
8-148	Ph	H	Ph	H	H	H	H	Me	H	H
8-149	Ph	H	Ph	H	H	H	H	H	Me	H
8-150	Ph	H	Ph	H	H	H	H	H	H	Me
8-151	Ph	H	Ph	H	Ph	H	H	H	H	H
8-152	Ph	H	Ph	H	H	Ph	H	H	H	H
8-153	Ph	H	Ph	H	H	H	Ph	H	H	H
8-154	Ph	H	Ph	H	H	H	H	Ph	H	H
8-155	Ph	H	Ph	H	H	H	H	H	Ph	H
8-156	Ph	H	Ph	H	H	H	H	H	H	Ph
8-157	Me	H	H	Ph	H	H	H	H	H	H
8-158	Me	H	H	Ph	Me	H	H	H	H	H
8-159	Me	H	H	Ph	H	Me	H	H	H	H
8-160	Me	H	H	Ph	H	H	Me	H	H	H
8-161	Me	H	H	Ph	H	H	H	Me	H	H
8-162	Me	H	H	Ph	H	H	H	H	Me	H
8-163	Me	H	H	Ph	H	H	H	H	H	Me
8-164	Me	H	H	Ph	Ph	H	H	H	H	H
8-165	Me	H	H	Ph	H	Ph	H	H	H	H
8-166	Me	H	H	Ph	H	H	Ph	H	H	H
8-167	Me	H	H	Ph	H	H	H	Ph	H	H
8-168	Me	H	H	Ph	H	H	H	H	Ph	H
8-169	Me	H	H	Ph	H	H	H	H	H	Ph
8-170	Ph	H	H	Ph	H	H	H	H	H	H
8-171	Ph	H	H	Ph	Me	H	H	H	H	H
8-172	Ph	H	H	Ph	H	Me	H	H	H	H
8-173	Ph	H	H	Ph	H	H	Me	H	H	H
8-174	Ph	H	H	Ph	H	H	H	Me	H	H
8-175	Ph	H	H	Ph	H	H	H	H	Me	H
8-176	Ph	H	H	Ph	H	H	H	H	H	Me
8-177	Ph	H	H	Ph	Ph	H	H	H	H	H
8-178	Ph	H	H	Ph	H	Ph	H	H	H	H
8-179	Ph	H	H	Ph	H	H	Ph	H	H	H
8-180	Ph	H	H	Ph	H	H	H	Ph	H	H
8-181	Ph	H	H	Ph	H	H	H	H	Ph	H
8-182	Ph	H	H	Ph	H	H	H	H	H	Ph

TABLE 9

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
9-1	Me	H	H	H	H	H	H	H	H	H	Me
9-2	Me	H	H	H	Me	H	H	H	H	H	Me
9-3	Me	H	H	H	H	Me	H	H	H	H	Me
9-4	Me	H	H	H	H	H	Me	H	H	H	Me
9-5	Me	H	H	H	H	H	H	Me	H	H	Me
9-6	Me	H	H	H	H	H	H	H	Me	H	Me
9-7	Me	H	H	H	H	H	H	H	H	Me	Me
9-8	Me	H	H	H	Ph	H	H	H	H	H	Me
9-9	Me	H	H	H	H	Ph	H	H	H	H	Me
9-10	Me	H	H	H	H	H	Ph	H	H	H	Me
9-11	Me	H	H	H	H	H	H	Ph	H	H	Me
9-12	Me	H	H	H	H	H	H	H	Ph	H	Me
9-13	Me	H	H	H	H	H	H	H	H	Ph	Me
9-14	Ph	H	H	H	H	H	H	H	H	H	Me

TABLE 9-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
9-15	Ph	H	H	H	Me	H	H	H	H	H	Me
9-16	Ph	H	H	H	H	Me	H	H	H	H	Me
9-17	Ph	H	H	H	H	H	Me	H	H	H	Me
9-18	Ph	H	H	H	H	H	H	Me	H	H	Me
9-19	Ph	H	H	H	H	H	H	H	Me	H	Me
9-20	Ph	H	H	H	H	H	H	H	H	Me	Me
9-21	Ph	H	H	H	Ph	H	H	H	H	H	Me
9-22	Ph	H	H	H	H	Ph	H	H	H	H	Me
9-23	Ph	H	H	H	H	H	Ph	H	H	H	Me
9-24	Ph	H	H	H	H	H	H	Ph	H	H	Me
9-25	Ph	H	H	H	H	H	H	H	Ph	H	Me
9-26	Ph	H	H	H	H	H	H	H	H	Ph	Me
9-27	Me	Me	H	H	H	H	H	H	H	H	Me
9-28	Me	Me	H	H	Me	H	H	H	H	H	Me
9-29	Me	Me	H	H	H	Me	H	H	H	H	Me
9-30	Me	Me	H	H	H	H	Me	H	H	H	Me
9-31	Me	Me	H	H	H	H	H	Me	H	H	Me
9-32	Me	Me	H	H	H	H	H	H	Me	H	Me
9-33	Me	Me	H	H	H	H	H	H	H	Me	Me
9-34	Me	Me	H	H	Ph	H	H	H	H	H	Me
9-35	Me	Me	H	H	H	Ph	H	H	H	H	Me
9-36	Me	Me	H	H	H	H	Ph	H	H	H	Me
9-37	Me	Me	H	H	H	H	H	Ph	H	H	Me
9-38	Me	Me	H	H	H	H	H	H	Ph	H	Me
9-39	Me	Me	H	H	H	H	H	H	H	Ph	Me
9-40	Ph	Me	H	H	H	H	H	H	H	H	Me
9-41	Ph	Me	H	H	Me	H	H	H	H	H	Me
9-42	Ph	Me	H	H	H	Me	H	H	H	H	Me
9-43	Ph	Me	H	H	H	H	Me	H	H	H	Me
9-44	Ph	Me	H	H	H	H	H	Me	H	H	Me
9-45	Ph	Me	H	H	H	H	H	H	Me	H	Me
9-46	Ph	Me	H	H	H	H	H	H	H	Me	Me
9-47	Ph	Me	H	H	Ph	H	H	H	H	H	Me
9-48	Ph	Me	H	H	H	Ph	H	H	H	H	Me
9-49	Ph	Me	H	H	H	H	Ph	H	H	H	Me
9-50	Ph	Me	H	H	H	H	H	Ph	H	H	Me
9-51	Ph	Me	H	H	H	H	H	H	Ph	H	Me
9-52	Ph	Me	H	H	H	H	H	H	H	Ph	Me
9-53	Me	H	Me	H	H	H	H	H	H	H	Me
9-54	Me	H	Me	H	Me	H	H	H	H	H	Me
9-55	Me	H	Me	H	H	Me	H	H	H	H	Me
9-56	Me	H	Me	H	H	H	Me	H	H	H	Me
9-57	Me	H	Me	H	H	H	H	Me	H	H	Me
9-58	Me	H	Me	H	H	H	H	H	Me	H	Me
9-59	Me	H	Me	H	H	H	H	H	H	Me	Me
9-60	Me	H	Me	H	Ph	H	H	H	H	H	Me
9-61	Me	H	Me	H	H	Ph	H	H	H	H	Me
9-62	Me	H	Me	H	H	H	Ph	H	H	H	Me
9-63	Me	H	Me	H	H	H	H	Ph	H	H	Me
9-64	Me	H	Me	H	H	H	H	H	Ph	H	Me
9-65	Me	H	Me	H	H	H	H	H	H	Ph	Me
9-66	Ph	H	Me	H	H	H	H	H	H	H	Me
9-67	Ph	H	Me	H	Me	H	H	H	H	H	Me
9-68	Ph	H	Me	H	H	Me	H	H	H	H	Me
9-69	Ph	H	Me	H	H	H	Me	H	H	H	Me
9-70	Ph	H	Me	H	H	H	H	Me	H	H	Me
9-71	Ph	H	Me	H	H	H	H	H	Me	H	Me
9-72	Ph	H	Me	H	H	H	H	H	H	Me	Me
9-73	Ph	H	Me	H	Ph	H	H	H	H	H	Me
9-74	Ph	H	Me	H	H	Ph	H	H	H	H	Me
9-75	Ph	H	Me	H	H	H	Ph	H	H	H	Me
9-76	Ph	H	Me	H	H	H	H	Ph	H	H	Me
9-77	Ph	H	Me	H	H	H	H	H	Ph	H	Me
9-78	Ph	H	Me	H	H	H	H	H	H	Ph	Me
9-79	Me	H	H	Me	H	H	H	H	H	H	Me
9-80	Me	H	H	Me	Me	H	H	H	H	H	Me
9-81	Me	H	H	Me	H	Me	H	H	H	H	Me
9-82	Me	H	H	Me	H	H	Me	H	H	H	Me
9-83	Me	H	H	Me	H	H	H	Me	H	H	Me
9-84	Me	H	H	Me	H	H	H	H	Me	H	Me
9-85	Me	H	H	Me	H	H	H	H	H	Me	Me
9-86	Me	H	H	Me	Ph	H	H	H	H	H	Me
9-87	Me	H	H	Me	H	Ph	H	H	H	H	Me
9-88	Me	H	H	Me	H	H	Ph	H	H	H	Me
9-89	Me	H	H	Me	H	H	H	Ph	H	H	Me
9-90	Me	H	H	Me	H	H	H	H	Ph	H	Me
9-91	Me	H	H	Me	H	H	H	H	H	Ph	Me
9-92	Ph	H	H	Me	H	H	H	H	H	H	Me

TABLE 9-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
9-93	Ph	H	H	Me	Me	H	H	H	H	H	Me
9-94	Ph	H	H	Me	H	Me	H	H	H	H	Me
9-95	Ph	H	H	Me	H	H	Me	H	H	H	Me
9-96	Ph	H	H	Me	H	H	H	Me	H	H	Me
9-97	Ph	H	H	Me	H	H	H	H	Me	H	Me
9-98	Ph	H	H	Me	H	H	H	H	H	Me	Me
9-99	Ph	H	H	Me	Ph	H	H	H	H	H	Me
9-100	Ph	H	H	Me	H	Ph	H	H	H	H	Me
9-101	Ph	H	H	Me	H	H	Ph	H	H	H	Me
9-102	Ph	H	H	Me	H	H	H	Ph	H	H	Me
9-103	Ph	H	H	Me	H	H	H	H	Ph	H	Me
9-104	Ph	H	H	Me	H	H	H	H	H	Ph	Me
9-105	Me	Ph	H	H	H	H	H	H	H	H	Me
9-106	Me	Ph	H	H	Me	H	H	H	H	H	Me
9-107	Me	Ph	H	H	H	Me	H	H	H	H	Me
9-108	Me	Ph	H	H	H	H	Me	H	H	H	Me
9-109	Me	Ph	H	H	H	H	H	Me	H	H	Me
9-110	Me	Ph	H	H	H	H	H	H	Me	H	Me
9-111	Me	Ph	H	H	H	H	H	H	H	Me	Me
9-112	Me	Ph	H	H	Ph	H	H	H	H	H	Me
9-113	Me	Ph	H	H	H	Ph	H	H	H	H	Me
9-114	Me	Ph	H	H	H	H	Ph	H	H	H	Me
9-115	Me	Ph	H	H	H	H	H	Ph	H	H	Me
9-116	Me	Ph	H	H	H	H	H	H	Ph	H	Me
9-117	Me	Ph	H	H	H	H	H	H	H	Ph	Me
9-118	Ph	Ph	H	H	H	H	H	H	H	H	Me
9-119	Ph	Ph	H	H	Me	H	H	H	H	H	Me
9-120	Ph	Ph	H	H	H	Me	H	H	H	H	Me
9-121	Ph	Ph	H	H	H	H	Me	H	H	H	Me
9-122	Ph	Ph	H	H	H	H	H	Me	H	H	Me
9-123	Ph	Ph	H	H	H	H	H	H	Me	H	Me
9-124	Ph	Ph	H	H	H	H	H	H	H	Me	Me
9-125	Ph	Ph	H	H	Ph	H	H	H	H	H	Me
9-126	Ph	Ph	H	H	H	Ph	H	H	H	H	Me
9-127	Ph	Ph	H	H	H	H	Ph	H	H	H	Me
9-128	Ph	Ph	H	H	H	H	H	Ph	H	H	Me
9-129	Ph	Ph	H	H	H	H	H	H	Ph	H	Me
9-130	Ph	Ph	H	H	H	H	H	H	H	Ph	Me
9-131	Me	H	Ph	H	H	H	H	H	H	H	Me
9-132	Me	H	Ph	H	Me	H	H	H	H	H	Me
9-133	Me	H	Ph	H	H	Me	H	H	H	H	Me
9-134	Me	H	Ph	H	H	H	Me	H	H	H	Me
9-135	Me	H	Ph	H	H	H	H	Me	H	H	Me
9-136	Me	H	Ph	H	H	H	H	H	Me	H	Me
9-137	Me	H	Ph	H	H	H	H	H	H	Me	Me
9-138	Me	H	Ph	H	Ph	H	H	H	H	H	Me
9-139	Me	H	Ph	H	H	Ph	H	H	H	H	Me
9-140	Me	H	Ph	H	H	H	Ph	H	H	H	Me
9-141	Me	H	Ph	H	H	H	H	Ph	H	H	Me
9-142	Me	H	Ph	H	H	H	H	H	Ph	H	Me
9-143	Me	H	Ph	H	H	H	H	H	H	Ph	Me
9-144	Ph	H	Ph	H	H	H	H	H	H	H	Me
9-145	Ph	H	Ph	H	Me	H	H	H	H	H	Me
9-146	Ph	H	Ph	H	H	Me	H	H	H	H	Me
9-147	Ph	H	Ph	H	H	H	Me	H	H	H	Me
9-148	Ph	H	Ph	H	H	H	H	Me	H	H	Me
9-149	Ph	H	Ph	H	H	H	H	H	Me	H	Me
9-150	Ph	H	Ph	H	H	H	H	H	H	Me	Me
9-151	Ph	H	Ph	H	Ph	H	H	H	H	H	Me
9-152	Ph	H	Ph	H	H	Ph	H	H	H	H	Me
9-153	Ph	H	Ph	H	H	H	Ph	H	H	H	Me
9-154	Ph	H	Ph	H	H	H	H	Ph	H	H	Me
9-155	Ph	H	Ph	H	H	H	H	H	Ph	H	Me
9-156	Ph	H	Ph	H	H	H	H	H	H	Ph	Me
9-157	Me	H	H	Ph	H	H	H	H	H	H	Me
9-158	Me	H	H	Ph	Me	H	H	H	H	H	Me
9-159	Me	H	H	Ph	H	Me	H	H	H	H	Me
9-160	Me	H	H	Ph	H	H	Me	H	H	H	Me
9-161	Me	H	H	Ph	H	H	H	Me	H	H	Me
9-162	Me	H	H	Ph	H	H	H	H	Me	H	Me
9-163	Me	H	H	Ph	H	H	H	H	H	Me	Me
9-164	Me	H	H	Ph	Ph	H	H	H	H	H	Me
9-165	Me	H	H	Ph	H	Ph	H	H	H	H	Me
9-166	Me	H	H	Ph	H	H	Ph	H	H	H	Me
9-167	Me	H	H	Ph	H	H	H	Ph	H	H	Me
9-168	Me	H	H	Ph	H	H	H	H	Ph	H	Me
9-169	Me	H	H	Ph	H	H	H	H	H	Ph	Me
9-170	Ph	H	H	Ph	H	H	H	H	H	H	Me

TABLE 9-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
9-171	Ph	H	H	Ph	Me	H	H	H	H	H	Me
9-172	Ph	H	H	Ph	H	Me	H	H	H	H	Me
9-173	Ph	H	H	Ph	H	H	Me	H	H	H	Me
9-174	Ph	H	H	Ph	H	H	H	Me	H	H	Me
9-175	Ph	H	H	Ph	H	H	H	H	Me	H	Me
9-176	Ph	H	H	Ph	H	H	H	H	H	Me	Me
9-177	Ph	H	H	Ph	Ph	H	H	H	H	H	Me
9-178	Ph	H	H	Ph	H	Ph	H	H	H	H	Me
9-179	Ph	H	H	Ph	H	H	Ph	H	H	H	Me
9-180	Ph	H	H	Ph	H	H	H	Ph	H	H	Me
9-181	Ph	H	H	Ph	H	H	H	H	Ph	H	Me
9-182	Ph	H	H	Ph	H	H	H	H	H	Ph	Me

TABLE 10

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
10-1	Me	H	H	H	H	H	H	H	H	H	H	H
10-2	Me	H	H	H	Me	H	H	H	H	H	H	H
10-3	Me	H	H	H	H	Me	H	H	H	H	H	H
10-4	Me	H	H	H	H	H	Me	H	H	H	H	H
10-5	Me	H	H	H	H	H	H	Me	H	H	H	H
10-6	Me	H	H	H	H	H	H	H	Me	H	H	H
10-7	Me	H	H	H	H	H	H	H	H	Me	H	H
10-8	Me	H	H	H	H	H	H	H	H	H	Me	H
10-9	Me	H	H	H	H	H	H	H	H	H	H	Me
10-10	Me	H	H	H	Ph	H	H	H	H	H	H	H
10-11	Me	H	H	H	H	Ph	H	H	H	H	H	H
10-12	Me	H	H	H	H	H	Ph	H	H	H	H	H
10-13	Me	H	H	H	H	H	H	Ph	H	H	H	H
10-14	Me	H	H	H	H	H	H	H	Ph	H	H	H
10-15	Me	H	H	H	H	H	H	H	H	Ph	H	H
10-16	Me	H	H	H	H	H	H	H	H	H	Ph	H
10-17	Me	H	H	H	H	H	H	H	H	H	H	Ph
10-18	Ph	H	H	H	H	H	H	H	H	H	H	H
10-19	Ph	H	H	H	Me	H	H	H	H	H	H	H
10-20	Ph	H	H	H	H	Me	H	H	H	H	H	H
10-21	Ph	H	H	H	H	H	Me	H	H	H	H	H
10-22	Ph	H	H	H	H	H	H	Me	H	H	H	H
10-23	Ph	H	H	H	H	H	H	H	Me	H	H	H
10-24	Ph	H	H	H	H	H	H	H	H	Me	H	H
10-25	Ph	H	H	H	H	H	H	H	H	H	Me	H
10-26	Ph	H	H	H	H	H	H	H	H	H	H	Me
10-27	Ph	H	H	H	Ph	H	H	H	H	H	H	H
10-28	Ph	H	H	H	H	Ph	H	H	H	H	H	H
10-29	Ph	H	H	H	H	H	Ph	H	H	H	H	H
10-30	Ph	H	H	H	H	H	H	Ph	H	H	H	H
10-31	Ph	H	H	H	H	H	H	H	Ph	H	H	H
10-32	Ph	H	H	H	H	H	H	H	H	Ph	H	H
10-33	Ph	H	H	H	H	H	H	H	H	H	Ph	H
10-34	Ph	H	H	H	H	H	H	H	H	H	H	Ph
10-35	Me	Me	H	H	H	H	H	H	H	H	H	H
10-36	Me	Me	H	H	Me	H	H	H	H	H	H	H
10-37	Me	Me	H	H	H	Me	H	H	H	H	H	H
10-38	Me	Me	H	H	H	H	Me	H	H	H	H	H
10-39	Me	Me	H	H	H	H	H	Me	H	H	H	H
10-40	Me	Me	H	H	H	H	H	H	Me	H	H	H
10-41	Me	Me	H	H	H	H	H	H	H	Me	H	H
10-42	Me	Me	H	H	H	H	H	H	H	H	Me	H
10-43	Me	Me	H	H	H	H	H	H	H	H	H	Me
10-44	Me	Me	H	H	Ph	H	H	H	H	H	H	H
10-45	Me	Me	H	H	H	Ph	H	H	H	H	H	H
10-46	Me	Me	H	H	H	H	Ph	H	H	H	H	H
10-47	Me	Me	H	H	H	H	H	Ph	H	H	H	H
10-48	Me	Me	H	H	H	H	H	H	Ph	H	H	H
10-49	Me	Me	H	H	H	H	H	H	H	Ph	H	H
10-50	Me	Me	H	H	H	H	H	H	H	H	Ph	H
10-51	Me	Me	H	H	H	H	H	H	H	H	H	Ph
10-52	Ph	Me	H	H	H	H	H	H	H	H	H	H
10-53	Ph	Me	H	H	Me	H	H	H	H	H	H	H
10-54	Ph	Me	H	H	H	Me	H	H	H	H	H	H
10-55	Ph	Me	H	H	H	H	Me	H	H	H	H	H
10-56	Ph	Me	H	H	H	H	H	Me	H	H	H	H
10-57	Ph	Me	H	H	H	H	H	H	Me	H	H	H
10-58	Ph	Me	H	H	H	H	H	H	H	Me	H	H

TABLE 10-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
10-59	Ph	Me	H	H	H	H	H	H	H	H	Me	H
10-60	Ph	Me	H	H	H	H	H	H	H	H	H	Me
10-61	Ph	Me	H	H	Ph	H	H	H	H	H	H	H
10-62	Ph	Me	H	H	H	Ph	H	H	H	H	H	H
10-63	Ph	Me	H	H	H	H	Ph	H	H	H	H	H
10-64	Ph	Me	H	H	H	H	H	Ph	H	H	H	H
10-65	Ph	Me	H	H	H	H	H	H	Ph	H	H	H
10-66	Ph	Me	H	H	H	H	H	H	H	Ph	H	H
10-67	Ph	Me	H	H	H	H	H	H	H	H	Ph	H
10-68	Ph	Me	H	H	H	H	H	H	H	H	H	Ph
10-69	Me	H	Me	H	H	H	H	H	H	H	H	H
10-70	Me	H	Me	H	Me	H	H	H	H	H	H	H
10-71	Me	H	Me	H	H	Me	H	H	H	H	H	H
10-72	Me	H	Me	H	H	H	Me	H	H	H	H	H
10-73	Me	H	Me	H	H	H	H	Me	H	H	H	H
10-74	Me	H	Me	H	H	H	H	H	Me	H	H	H
10-75	Me	H	Me	H	H	H	H	H	H	Me	H	H
10-76	Me	H	Me	H	H	H	H	H	H	H	Me	H
10-77	Me	H	Me	H	H	H	H	H	H	H	H	Me
10-78	Me	H	Me	H	Ph	H	H	H	H	H	H	H
10-79	Me	H	Me	H	H	Ph	H	H	H	H	H	H
10-80	Me	H	Me	H	H	H	Ph	H	H	H	H	H
10-81	Me	H	Me	H	H	H	H	Ph	H	H	H	H
10-82	Me	H	Me	H	H	H	H	H	Ph	H	H	H
10-83	Me	H	Me	H	H	H	H	H	H	Ph	H	H
10-84	Me	H	Me	H	H	H	H	H	H	H	Ph	H
10-85	Me	H	Me	H	H	H	H	H	H	H	H	Ph
10-86	Ph	H	Me	H	H	H	H	H	H	H	H	H
10-87	Ph	H	Me	H	Me	H	H	H	H	H	H	H
10-88	Ph	H	Me	H	H	Me	H	H	H	H	H	H
10-89	Ph	H	Me	H	H	H	Me	H	H	H	H	H
10-90	Ph	H	Me	H	H	H	H	Me	H	H	H	H
10-91	Ph	H	Me	H	H	H	H	H	Me	H	H	H
10-92	Ph	H	Me	H	H	H	H	H	H	Me	H	H
10-93	Ph	H	Me	H	H	H	H	H	H	H	Me	H
10-94	Ph	H	Me	H	H	H	H	H	H	H	H	Me
10-95	Ph	H	Me	H	Ph	H	H	H	H	H	H	H
10-96	Ph	H	Me	H	H	Ph	H	H	H	H	H	H
10-97	Ph	H	Me	H	H	H	Ph	H	H	H	H	H
10-98	Ph	H	Me	H	H	H	H	Ph	H	H	H	H
10-99	Ph	H	Me	H	H	H	H	H	Ph	H	H	H
10-100	Ph	H	Me	H	H	H	H	H	H	Ph	H	H
10-101	Ph	H	Me	H	H	H	H	H	H	H	Ph	H
10-102	Ph	H	Me	H	H	H	H	H	H	H	H	Ph
10-103	Me	H	H	Me	H	H	H	H	H	H	H	H
10-104	Me	H	H	Me	Me	H	H	H	H	H	H	H
10-105	Me	H	H	Me	H	Me	H	H	H	H	H	H
10-106	Me	H	H	Me	H	H	Me	H	H	H	H	H
10-107	Me	H	H	Me	H	H	H	Me	H	H	H	H
10-108	Me	H	H	Me	H	H	H	H	Me	H	H	H
10-109	Me	H	H	Me	H	H	H	H	H	Me	H	H
10-110	Me	H	H	Me	H	H	H	H	H	H	Me	H
10-111	Me	H	H	Me	H	H	H	H	H	H	H	Me
10-112	Me	H	H	Me	Ph	H	H	H	H	H	H	H
10-113	Me	H	H	Me	H	Ph	H	H	H	H	H	H
10-114	Me	H	H	Me	H	H	Ph	H	H	H	H	H
10-115	Me	H	H	Me	H	H	H	Ph	H	H	H	H
10-116	Me	H	H	Me	H	H	H	H	Ph	H	H	H
10-117	Me	H	H	Me	H	H	H	H	H	Ph	H	H
10-118	Me	H	H	Me	H	H	H	H	H	H	Ph	H
10-119	Me	H	H	Me	H	H	H	H	H	H	H	Ph
10-120	Ph	H	H	Me	H	H	H	H	H	H	H	H
10-121	Ph	H	H	Me	Me	H	H	H	H	H	H	H
10-122	Ph	H	H	Me	H	Me	H	H	H	H	H	H
10-123	Ph	H	H	Me	H	H	Me	H	H	H	H	H
10-124	Ph	H	H	Me	H	H	H	Me	H	H	H	H
10-125	Ph	H	H	Me	H	H	H	H	Me	H	H	H
10-126	Ph	H	H	Me	H	H	H	H	H	Me	H	H
10-127	Ph	H	H	Me	H	H	H	H	H	H	Me	H
10-128	Ph	H	H	Me	H	H	H	H	H	H	H	Me
10-129	Ph	H	H	Me	Ph	H	H	H	H	H	H	H
10-130	Ph	H	H	Me	H	Ph	H	H	H	H	H	H
10-131	Ph	H	H	Me	H	H	Ph	H	H	H	H	H
10-132	Ph	H	H	Me	H	H	H	Ph	H	H	H	H
10-133	Ph	H	H	Me	H	H	H	H	Ph	H	H	H
10-134	Ph	H	H	Me	H	H	H	H	H	Ph	H	H
10-135	Ph	H	H	Me	H	H	H	H	H	H	Ph	H
10-136	Ph	H	H	Me	H	H	H	H	H	H	H	Ph

TABLE 10-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
10-137	Me	Ph	H	H	H	H	H	H	H	H	H	H
10-138	Me	Ph	H	H	Me	H	H	H	H	H	H	H
10-139	Me	Ph	H	H	H	Me	H	H	H	H	H	H
10-140	Me	Ph	H	H	H	H	Me	H	H	H	H	H
10-141	Me	Ph	H	H	H	H	H	Me	H	H	H	H
10-142	Me	Ph	H	H	H	H	H	H	Me	H	H	H
10-143	Me	Ph	H	H	H	H	H	H	H	Me	H	H
10-144	Me	Ph	H	H	H	H	H	H	H	H	Me	H
10-145	Me	Ph	H	H	H	H	H	H	H	H	H	Me
10-146	Me	Ph	H	H	Ph	H	H	H	H	H	H	H
10-147	Me	Ph	H	H	H	Ph	H	H	H	H	H	H
10-148	Me	Ph	H	H	H	H	Ph	H	H	H	H	H
10-149	Me	Ph	H	H	H	H	H	Ph	H	H	H	H
10-150	Me	Ph	H	H	H	H	H	H	Ph	H	H	H
10-151	Me	Ph	H	H	H	H	H	H	H	Ph	H	H
10-152	Me	Ph	H	H	H	H	H	H	H	H	Ph	H
10-153	Me	Ph	H	H	H	H	H	H	H	H	H	Ph
10-154	Ph	Ph	H	H	H	H	H	H	H	H	H	H
10-155	Ph	Ph	H	H	Me	H	H	H	H	H	H	H
10-156	Ph	Ph	H	H	H	Me	H	H	H	H	H	H
10-157	Ph	Ph	H	H	H	H	Me	H	H	H	H	H
10-158	Ph	Ph	H	H	H	H	H	Me	H	H	H	H
10-159	Ph	Ph	H	H	H	H	H	H	Me	H	H	H
10-160	Ph	Ph	H	H	H	H	H	H	H	Me	H	H
10-161	Ph	Ph	H	H	H	H	H	H	H	H	Me	H
10-162	Ph	Ph	H	H	H	H	H	H	H	H	H	Me
10-163	Ph	Ph	H	H	Ph	H	H	H	H	H	H	H
10-164	Ph	Ph	H	H	H	Ph	H	H	H	H	H	H
10-165	Ph	Ph	H	H	H	H	Ph	H	H	H	H	H
10-166	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H
10-167	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H
10-168	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H
10-169	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H
10-170	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph
10-171	Me	H	Ph	H	H	H	H	H	H	H	H	H
10-172	Me	H	Ph	H	Me	H	H	H	H	H	H	H
10-173	Me	H	Ph	H	H	Me	H	H	H	H	H	H
10-174	Me	H	Ph	H	H	H	Me	H	H	H	H	H
10-175	Me	H	Ph	H	H	H	H	Me	H	H	H	H
10-176	Me	H	Ph	H	H	H	H	H	Me	H	H	H
10-177	Me	H	Ph	H	H	H	H	H	H	Me	H	H
10-178	Me	H	Ph	H	H	H	H	H	H	H	Me	H
10-179	Me	H	Ph	H	H	H	H	H	H	H	H	Me
10-180	Me	H	Ph	H	Ph	H	H	H	H	H	H	H
10-181	Me	H	Ph	H	H	Ph	H	H	H	H	H	H
10-182	Me	H	Ph	H	H	H	Ph	H	H	H	H	H
10-183	Me	H	Ph	H	H	H	H	Ph	H	H	H	H
10-184	Me	H	Ph	H	H	H	H	H	Ph	H	H	H
10-185	Me	H	Ph	H	H	H	H	H	H	Ph	H	H
10-186	Me	H	Ph	H	H	H	H	H	H	H	Ph	H
10-187	Me	H	Ph	H	H	H	H	H	H	H	H	Ph
10-188	Ph	H	Ph	H	H	H	H	H	H	H	H	H
10-189	Ph	H	Ph	H	Me	H	H	H	H	H	H	H
10-190	Ph	H	Ph	H	H	Me	H	H	H	H	H	H
10-191	Ph	H	Ph	H	H	H	Me	H	H	H	H	H
10-192	Ph	H	Ph	H	H	H	H	Me	H	H	H	H
10-193	Ph	H	Ph	H	H	H	H	H	Me	H	H	H
10-194	Ph	H	Ph	H	H	H	H	H	H	Me	H	H
10-195	Ph	H	Ph	H	H	H	H	H	H	H	Me	H
10-196	Ph	H	Ph	H	H	H	H	H	H	H	H	Me
10-197	Ph	H	Ph	H	Ph	H	H	H	H	H	H	H
10-198	Ph	H	Ph	H	H	Ph	H	H	H	H	H	H
10-199	Ph	H	Ph	H	H	H	Ph	H	H	H	H	H
10-200	Ph	H	Ph	H	H	H	H	Ph	H	H	H	H
10-201	Ph	H	Ph	H	H	H	H	H	Ph	H	H	H
10-202	Ph	H	Ph	H	H	H	H	H	H	Ph	H	H
10-203	Ph	H	Ph	H	H	H	H	H	H	H	Ph	H
10-204	Ph	H	Ph	H	H	H	H	H	H	H	H	Ph
10-205	Me	H	H	Ph	H	H	H	H	H	H	H	H
10-206	Me	H	H	Ph	Me	H	H	H	H	H	H	H
10-207	Me	H	H	Ph	H	Me	H	H	H	H	H	H
10-208	Me	H	H	Ph	H	H	Me	H	H	H	H	H
10-209	Me	H	H	Ph	H	H	H	Me	H	H	H	H
10-210	Me	H	H	Ph	H	H	H	H	Me	H	H	H
10-211	Me	H	H	Ph	H	H	H	H	H	Me	H	H
10-212	Me	H	H	Ph	H	H	H	H	H	H	Me	H
10-213	Me	H	H	Ph	H	H	H	H	H	H	H	Me
10-214	Me	H	H	Ph	Ph	H	H	H	H	H	H	H

TABLE 10-continued

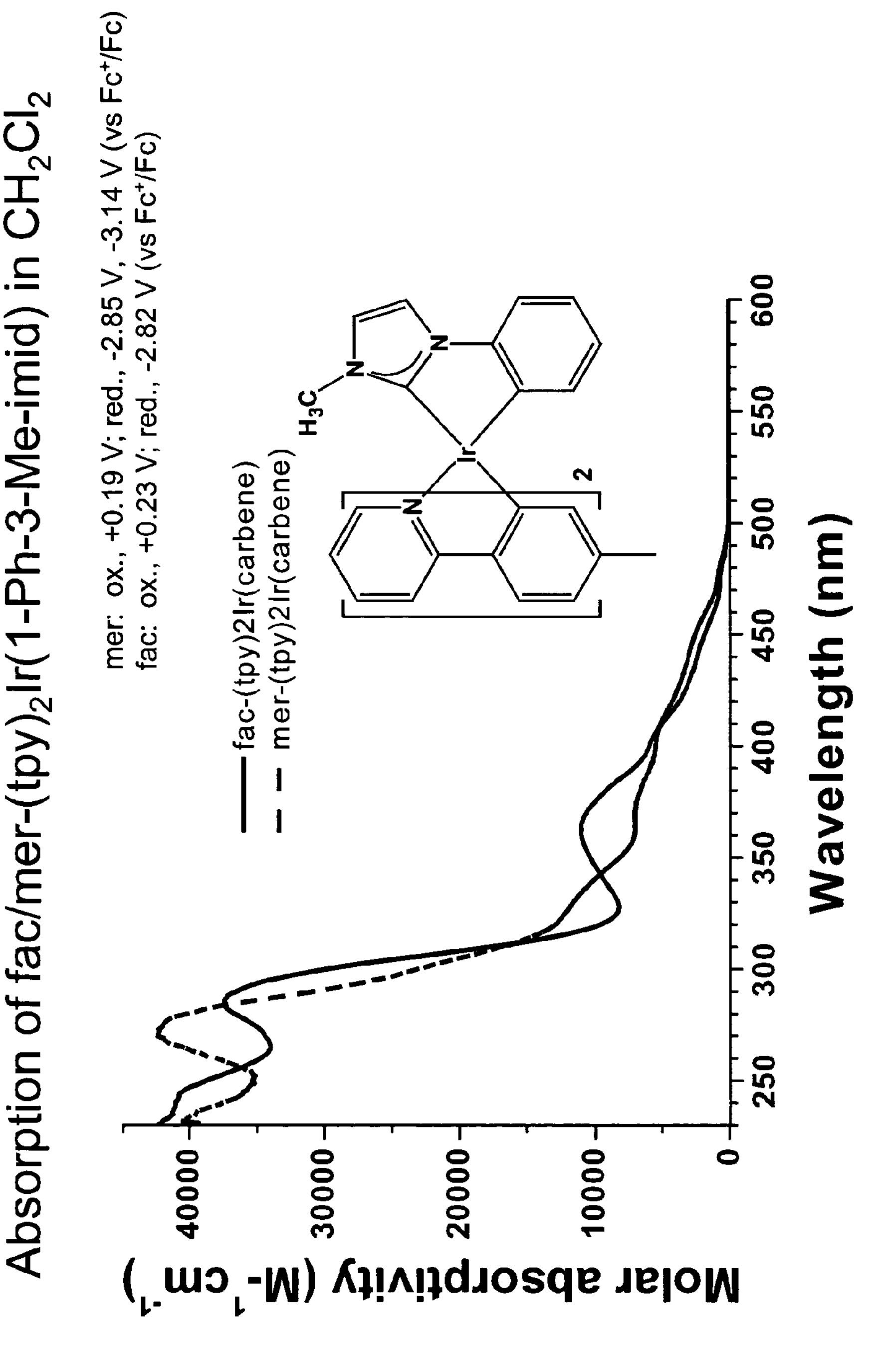
Cpd No.	Ra1	Ra2	Ra3	Ra4	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
10-215	Me	H	H	Ph	H	Ph	H	H	H	H	H	H
10-216	Me	H	H	Ph	H	H	Ph	H	H	H	H	H
10-217	Me	H	H	Ph	H	H	H	Ph	H	H	H	H
10-218	Me	H	H	Ph	H	H	H	H	Ph	H	H	H
10-219	Me	H	H	Ph	H	H	H	H	H	Ph	H	H
10-220	Me	H	H	Ph	H	H	H	H	H	H	Ph	H
10-221	Me	H	H	Ph	H	H	H	H	H	H	H	Ph
10-222	Ph	H	H	Ph	H	H	H	H	H	H	H	H
10-223	Ph	H	H	Ph	Me	H	H	H	H	H	H	H
10-224	Ph	H	H	Ph	H	Me	H	H	H	H	H	H
10-225	Ph	H	H	Ph	H	H	Me	H	H	H	H	H
10-226	Ph	H	H	Ph	H	H	H	Me	H	H	H	H
10-227	Ph	H	H	Ph	H	H	H	H	Me	H	H	H
10-228	Ph	H	H	Ph	H	H	H	H	H	Me	H	H
10-229	Ph	H	H	Ph	H	H	H	H	H	H	Me	H
10-230	Ph	H	H	Ph	H	H	H	H	H	H	H	Me
10-231	Ph	H	H	Ph	Ph	H	H	H	H	H	H	H
10-232	Ph	H	H	Ph	H	Ph	H	H	H	H	H	H
10-233	Ph	H	H	Ph	H	H	Ph	H	H	H	H	H
10-234	Ph	H	H	Ph	H	H	H	Ph	H	H	H	H
10-235	Ph	H	H	Ph	H	H	H	H	Ph	H	H	H
10-236	Ph	H	H	Ph	H	H	H	H	H	Ph	H	H
10-237	Ph	H	H	Ph	H	H	H	H	H	H	Ph	H
10-238	Ph	H	H	Ph	H	H	H	H	H	H	H	Ph

TABLE 11

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2
11-1	Me	H	H	H	H	H	H
11-2	Me	H	H	H	H	Me	H
11-3	Me	H	H	H	H	H	Me
11-4	Me	H	H	H	H	Ph	H
11-5	Me	H	H	H	H	H	Ph
11-6	Ph	H	H	H	H	H	H
11-7	Ph	H	H	H	H	Me	H
11-8	Ph	H	H	H	H	H	Me
11-9	Ph	H	H	H	H	Ph	H
11-10	Ph	H	H	H	H	H	Ph
11-11	Me	Me	H	H	H	H	H
11-12	Me	Me	H	H	H	Me	H
11-13	Me	Me	H	H	H	H	Me
11-14	Me	Me	H	H	H	Ph	H
11-15	Me	Me	H	H	H	H	Ph
11-16	Ph	Me	H	H	H	H	H
11-17	Ph	Me	H	H	H	Me	H
11-18	Ph	Me	H	H	H	H	Me
11-19	Ph	Me	H	H	H	Ph	H
11-20	Ph	Me	H	H	H	H	Ph
11-21	Me	H	Me	H	H	H	H
11-22	Me	H	Me	H	H	Me	H
11-23	Me	H	Me	H	H	H	Me
11-24	Me	H	Me	H	H	Ph	H
11-25	Me	H	Me	H	H	H	Ph
11-26	Ph	H	Me	H	H	H	H
11-27	Ph	H	Me	H	H	Me	H
11-28	Ph	H	Me	H	H	H	Me
11-29	Ph	H	Me	H	H	Ph	H
11-30	Ph	H	Me	H	H	H	Ph
11-31	Me	H	H	Me	H	H	H
11-32	Me	H	H	Me	H	Me	H
11-33	Me	H	H	Me	H	H	Me
11-34	Me	H	H	Me	H	Ph	H
11-35	Me	H	H	Me	H	H	Ph
11-36	Ph	H	H	Me	H	H	H
11-37	Ph	H	H	Me	H	Me	H
11-38	Ph	H	H	Me	H	H	Me
11-39	Ph	H	H	Me	H	Ph	H
11-40	Ph	H	H	Me	H	H	Ph
11-41	Me	H	H	H	Me	H	H
11-42	Me	H	H	H	Me	Me	H
11-43	Me	H	H	H	Me	H	Me
11-44	Me	H	H	H	Me	Ph	H
11-45	Me	H	H	H	Me	H	Ph
11-46	Ph	H	H	H	Me	H	H

TABLE 11-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2
11-47	Ph	H	H	H	Me	Me	H
11-48	Ph	H	H	H	Me	H	Me
11-49	Ph	H	H	H	Me	Ph	H
11-50	Ph	H	H	H	Me	H	Ph
11-51	Me	Ph	H	H	H	H	H
11-52	Me	Ph	H	H	H	Me	H
11-53	Me	Ph	H	H	H	H	Me
11-54	Me	Ph	H	H	H	Ph	H
11-55	Me	Ph	H	H	H	H	Ph
11-56	Ph	Ph	H	H	H	H	H
11-57	Ph	Ph	H	H	H	Me	H
11-58	Ph	Ph	H	H	H	H	Me
11-59	Ph	Ph	H	H	H	Ph	H
11-60	Ph	Ph	H	H	H	H	Ph
11-61	Me	H	Ph	H	H	H	H
11-62	Me	H	Ph	H	H	Me	H
11-63	Me	H	Ph	H	H	H	Me
11-64	Me	H	Ph	H	H	Ph	H
11-65	Me	H	Ph	H	H	H	Ph
11-66	Ph	H	Ph	H	H	H	H
11-67	Ph	H	Ph	H	H	Me	H
11-68	Ph	H	Ph	H	H	H	Me
11-69	Ph	H	Ph	H	H	Ph	H
11-70	Ph	H	Ph	H	H	H	Ph
11-71	Me	H	H	Ph	H	H	H
11-72	Me	H	H	Ph	H	Me	H
11-73	Me	H	H	Ph	H	H	Me
11-74	Me	H	H	Ph	H	Ph	H
11-75	Me	H	H	Ph	H	H	Ph
11-76	Ph	H	H	Ph	H	H	H
11-77	Ph	H	H	Ph	H	Me	H
11-78	Ph	H	H	Ph	H	H	Me
11-79	Ph	H	H	Ph	H	Ph	H
11-80	Ph	H	H	Ph	H	H	Ph
11-81	Me	H	H	H	Ph	H	H
11-82	Me	H	H	H	Ph	Me	H
11-83	Me	H	H	H	Ph	H	Me
11-84	Me	H	H	H	Ph	Ph	H
11-85	Me	H	H	H	Ph	H	Ph
11-86	Ph	H	H	H	Ph	H	H
11-87	Ph	H	H	H	Ph	Me	H
11-88	Ph	H	H	H	Ph	H	Me
11-89	Ph	H	H	H	Ph	Ph	H
11-90	Ph	H	H	H	Ph	H	Ph



Absorption of fac/mer-(tpy)$_2$Ir(1-Ph-3-Me-imid) in CH_2Cl_2
mer: ox., +0.19 V; red., -2.85 V, -3.14 V (vs Fc$^+$/Fc)
fac: ox., +0.23 V; red., -2.82 V (vs Fc$^+$/Fc)
fac-(tpy)2Ir(carbene)
mer-(tpy)2Ir(carbene)
H_3C
N
N
Ir
N
2
Molar absorptivity ($M^{-1}cm^{-1}$)
40000
30000
20000
10000
0
250
300
350
400
450
500
550
600
Wavelength (nm)

Figure 8

TABLE 12

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4
12-1	Me	H	H	H	H	H	H	H	H
12-2	Me	H	H	H	H	Me	H	H	H
12-3	Me	H	H	H	H	H	Me	H	H
12-4	Me	H	H	H	H	H	H	Me	H
12-5	Me	H	H	H	H	H	H	H	Me
12-6	Me	H	H	H	H	Ph	H	H	H
12-7	Me	H	H	H	H	H	Ph	H	H
12-8	Me	H	H	H	H	H	H	Ph	H
12-9	Me	H	H	H	H	H	H	H	Ph
12-10	Ph	H	H	H	H	H	H	H	H
12-11	Ph	H	H	H	H	Me	H	H	H
12-12	Ph	H	H	H	H	H	Me	H	H
12-13	Ph	H	H	H	H	H	H	Me	H
12-14	Ph	H	H	H	H	H	H	H	Me
12-15	Ph	H	H	H	H	Ph	H	H	H
12-16	Ph	H	H	H	H	H	Ph	H	H
12-17	Ph	H	H	H	H	H	H	Ph	H
12-18	Ph	H	H	H	H	H	H	H	Ph
12-19	Me	Me	H	H	H	H	H	H	H
12-20	Me	Me	H	H	H	Me	H	H	H
12-21	Me	Me	H	H	H	H	Me	H	H
12-22	Me	Me	H	H	H	H	H	Me	H
12-23	Me	Me	H	H	H	H	H	H	Me
12-24	Me	Me	H	H	H	Ph	H	H	H
12-25	Me	Me	H	H	H	H	Ph	H	H
12-26	Me	Me	H	H	H	H	H	Ph	H
12-27	Me	Me	H	H	H	H	H	H	Ph
12-28	Ph	Me	H	H	H	H	H	H	H
12-29	Ph	Me	H	H	H	Me	H	H	H
12-30	Ph	Me	H	H	H	H	Me	H	H
12-31	Ph	Me	H	H	H	H	H	Me	H
12-32	Ph	Me	H	H	H	H	H	H	Me
12-33	Ph	Me	H	H	H	Ph	H	H	H
12-34	Ph	Me	H	H	H	H	Ph	H	H
12-35	Ph	Me	H	H	H	H	H	Ph	H
12-36	Ph	Me	H	H	H	H	H	H	Ph
12-37	Me	H	Me	H	H	H	H	H	H
12-38	Me	H	Me	H	H	Me	H	H	H
12-39	Me	H	Me	H	H	H	Me	H	H
12-40	Me	H	Me	H	H	H	H	Me	H
12-41	Me	H	Me	H	H	H	H	H	Me
12-42	Me	H	Me	H	H	Ph	H	H	H
12-43	Me	H	Me	H	H	H	Ph	H	H
12-44	Me	H	Me	H	H	H	H	Ph	H
12-45	Me	H	Me	H	H	H	H	H	Ph
12-46	Ph	H	Me	H	H	H	H	H	H
12-47	Ph	H	Me	H	H	Me	H	H	H
12-48	Ph	H	Me	H	H	H	Me	H	H
12-49	Ph	H	Me	H	H	H	H	Me	H
12-50	Ph	H	Me	H	H	H	H	H	Me
12-51	Ph	H	Me	H	H	Ph	H	H	H
12-52	Ph	H	Me	H	H	H	Ph	H	H
12-53	Ph	H	Me	H	H	H	H	Ph	H
12-54	Ph	H	Me	H	H	H	H	H	Ph
12-55	Me	H	H	Me	H	H	H	H	H
12-56	Me	H	H	Me	H	Me	H	H	H
12-57	Me	H	H	Me	H	H	Me	H	H
12-58	Me	H	H	Me	H	H	H	Me	H
12-59	Me	H	H	Me	H	H	H	H	Me
12-60	Me	H	H	Me	H	Ph	H	H	H
12-61	Me	H	H	Me	H	H	Ph	H	H
12-62	Me	H	H	Me	H	H	H	Ph	H
12-63	Me	H	H	Me	H	H	H	H	Ph
12-64	Ph	H	H	Me	H	H	H	H	H
12-65	Ph	H	H	Me	H	Me	H	H	H
12-66	Ph	H	H	Me	H	H	Me	H	H
12-67	Ph	H	H	Me	H	H	H	Me	H
12-68	Ph	H	H	Me	H	H	H	H	Me
12-69	Ph	H	H	Me	H	Ph	H	H	H
12-70	Ph	H	H	Me	H	H	Ph	H	H
12-71	Ph	H	H	Me	H	H	H	Ph	H
12-72	Ph	H	H	Me	H	H	H	H	Ph
12-73	Me	H	H	H	Me	H	H	H	H
12-74	Me	H	H	H	Me	Me	H	H	H
12-75	Me	H	H	H	Me	H	Me	H	H
12-76	Me	H	H	H	Me	H	H	Me	H
12-77	Me	H	H	H	Me	H	H	H	Me
12-78	Me	H	H	H	Me	Ph	H	H	H
12-79	Me	H	H	H	Me	H	Ph	H	H
12-80	Me	H	H	H	Me	H	H	Ph	H
12-81	Me	H	H	H	Me	H	H	H	Ph
12-82	Ph	H	H	H	Me	H	H	H	H
12-83	Ph	H	H	H	Me	Me	H	H	H
12-84	Ph	H	H	H	Me	H	Me	H	H
12-85	Ph	H	H	H	Me	H	H	Me	H
12-86	Ph	H	H	H	Me	H	H	H	Me
12-87	Ph	H	H	H	Me	Ph	H	H	H
12-88	Ph	H	H	H	Me	H	Ph	H	H
12-89	Ph	H	H	H	Me	H	H	Ph	H
12-90	Ph	H	H	H	Me	H	H	H	Ph
12-91	Me	Ph	H	H	H	H	H	H	H
12-92	Me	Ph	H	H	H	Me	H	H	H
12-93	Me	Ph	H	H	H	H	Me	H	H
12-94	Me	Ph	H	H	H	H	H	Me	H
12-95	Me	Ph	H	H	H	H	H	H	Me
12-96	Me	Ph	H	H	H	Ph	H	H	H
12-97	Me	Ph	H	H	H	H	Ph	H	H
12-98	Me	Ph	H	H	H	H	H	Ph	H
12-99	Me	Ph	H	H	H	H	H	H	Ph
12-100	Ph	Ph	H	H	H	H	H	H	H
12-101	Ph	Ph	H	H	H	Me	H	H	H
12-102	Ph	Ph	H	H	H	H	Me	H	H
12-103	Ph	Ph	H	H	H	H	H	Me	H
12-104	Ph	Ph	H	H	H	H	H	H	Me
12-105	Ph	Ph	H	H	H	Ph	H	H	H
12-106	Ph	Ph	H	H	H	H	Ph	H	H
12-107	Ph	Ph	H	H	H	H	H	Ph	H
12-108	Ph	Ph	H	H	H	H	H	H	Ph
12-109	Me	H	Ph	H	H	H	H	H	H
12-110	Me	H	Ph	H	H	Me	H	H	H
12-111	Me	H	Ph	H	H	H	Me	H	H
12-112	Me	H	Ph	H	H	H	H	Me	H
12-113	Me	H	Ph	H	H	H	H	H	Me
12-114	Me	H	Ph	H	H	Ph	H	H	H
12-115	Me	H	Ph	H	H	H	Ph	H	H
12-116	Me	H	Ph	H	H	H	H	Ph	H
12-117	Me	H	Ph	H	H	H	H	H	Ph
12-118	Ph	H	Ph	H	H	H	H	H	H
12-119	Ph	H	Ph	H	H	Me	H	H	H
12-120	Ph	H	Ph	H	H	H	Me	H	H
12-121	Ph	H	Ph	H	H	H	H	Me	H
12-122	Ph	H	Ph	H	H	H	H	H	Me
12-123	Ph	H	Ph	H	H	Ph	H	H	H
12-124	Ph	H	Ph	H	H	H	Ph	H	H
12-125	Ph	H	Ph	H	H	H	H	Ph	H
12-126	Ph	H	Ph	H	H	H	H	H	Ph
12-127	Me	H	H	Ph	H	H	H	H	H
12-128	Me	H	H	Ph	H	Me	H	H	H
12-129	Me	H	H	Ph	H	H	Me	H	H
12-130	Me	H	H	Ph	H	H	H	Me	H
12-131	Me	H	H	Ph	H	H	H	H	Me
12-132	Me	H	H	Ph	H	Ph	H	H	H
12-133	Me	H	H	Ph	H	H	Ph	H	H
12-134	Me	H	H	Ph	H	H	H	Ph	H
12-135	Me	H	H	Ph	H	H	H	H	Ph
12-136	Ph	H	H	Ph	H	H	H	H	H
12-137	Ph	H	H	Ph	H	Me	H	H	H
12-138	Ph	H	H	Ph	H	H	Me	H	H
12-139	Ph	H	H	Ph	H	H	H	Me	H
12-140	Ph	H	H	Ph	H	H	H	H	Me
12-141	Ph	H	H	Ph	H	Ph	H	H	H
12-142	Ph	H	H	Ph	H	H	Ph	H	H
12-143	Ph	H	H	Ph	H	H	H	Ph	H
12-144	Ph	H	H	Ph	H	H	H	H	Ph
12-145	Me	H	H	H	Ph	H	H	H	H
12-146	Me	H	H	H	Ph	Me	H	H	H
12-147	Me	H	H	H	Ph	H	Me	H	H
12-148	Me	H	H	H	Ph	H	H	Me	H
12-149	Me	H	H	H	Ph	H	H	H	Me
12-150	Me	H	H	H	Ph	Ph	H	H	H
12-151	Me	H	H	H	Ph	H	Ph	H	H
12-152	Me	H	H	H	Ph	H	H	Ph	H
12-153	Me	H	H	H	Ph	H	H	H	Ph
12-154	Ph	H	H	H	Ph	H	H	H	H

TABLE 12-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4
12-155	Ph	H	H	H	Ph	Me	H	H	H
12-156	Ph	H	H	H	Ph	H	Me	H	H
12-157	Ph	H	H	H	Ph	H	H	Me	H
12-158	Ph	H	H	H	Ph	H	H	H	Me
12-159	Ph	H	H	H	Ph	Ph	H	H	H
12-160	Ph	H	H	H	Ph	H	Ph	H	H
12-161	Ph	H	H	H	Ph	H	H	Ph	H
12-162	Ph	H	H	H	Ph	H	H	H	Ph

TABLE 13

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
13-1	Me	H	H	H	H	H	H	H	H	H	H
13-2	Me	H	H	H	H	Me	H	H	H	H	H
13-3	Me	H	H	H	H	H	Me	H	H	H	H
13-4	Me	H	H	H	H	H	H	Me	H	H	H
13-5	Me	H	H	H	H	H	H	H	Me	H	H
13-6	Me	H	H	H	H	H	H	H	H	Me	H
13-7	Me	H	H	H	H	H	H	H	H	H	Me
13-8	Me	H	H	H	H	Ph	H	H	H	H	H
13-9	Me	H	H	H	H	H	Ph	H	H	H	H
13-10	Me	H	H	H	H	H	H	Ph	H	H	H
13-11	Me	H	H	H	H	H	H	H	Ph	H	H
13-12	Me	H	H	H	H	H	H	H	H	Ph	H
13-13	Me	H	H	H	H	H	H	H	H	H	Ph
13-14	Ph	H	H	H	H	H	H	H	H	H	H
13-15	Ph	H	H	H	H	Me	H	H	H	H	H
13-16	Ph	H	H	H	H	H	Me	H	H	H	H
13-17	Ph	H	H	H	H	H	H	Me	H	H	H
13-18	Ph	H	H	H	H	H	H	H	Me	H	H
13-19	Ph	H	H	H	H	H	H	H	H	Me	H
13-20	Ph	H	H	H	H	H	H	H	H	H	Me
13-21	Ph	H	H	H	H	Ph	H	H	H	H	H
13-22	Ph	H	H	H	H	H	Ph	H	H	H	H
13-23	Ph	H	H	H	H	H	H	Ph	H	H	H
13-24	Ph	H	H	H	H	H	H	H	Ph	H	H
13-25	Ph	H	H	H	H	H	H	H	H	Ph	H
13-26	Ph	H	H	H	H	H	H	H	H	H	Ph
13-27	Me	Me	H	H	H	H	H	H	H	H	H
13-28	Me	Me	H	H	H	Me	H	H	H	H	H
13-29	Me	Me	H	H	H	H	Me	H	H	H	H
13-30	Me	Me	H	H	H	H	H	Me	H	H	H
13-31	Me	Me	H	H	H	H	H	H	Me	H	H
13-32	Me	Me	H	H	H	H	H	H	H	Me	H
13-33	Me	Me	H	H	H	H	H	H	H	H	Me
13-34	Me	Me	H	H	H	Ph	H	H	H	H	H
13-35	Me	Me	H	H	H	H	Ph	H	H	H	H
13-36	Me	Me	H	H	H	H	H	Ph	H	H	H
13-37	Me	Me	H	H	H	H	H	H	Ph	H	H
13-38	Me	Me	H	H	H	H	H	H	H	Ph	H
13-39	Me	Me	H	H	H	H	H	H	H	H	Ph
13-40	Ph	Me	H	H	H	H	H	H	H	H	H
13-41	Ph	Me	H	H	H	Me	H	H	H	H	H
13-42	Ph	Me	H	H	H	H	Me	H	H	H	H
13-43	Ph	Me	H	H	H	H	H	Me	H	H	H
13-44	Ph	Me	H	H	H	H	H	H	Me	H	H
13-45	Ph	Me	H	H	H	H	H	H	H	Me	H
13-46	Ph	Me	H	H	H	H	H	H	H	H	Me
13-47	Ph	Me	H	H	H	Ph	H	H	H	H	H
13-48	Ph	Me	H	H	H	H	Ph	H	H	H	H
13-49	Ph	Me	H	H	H	H	H	Ph	H	H	H
13-50	Ph	Me	H	H	H	H	H	H	Ph	H	H
13-51	Ph	Me	H	H	H	H	H	H	H	Ph	H
13-52	Ph	Me	H	H	H	H	H	H	H	H	Ph
13-53	Me	H	Me	H	H	H	H	H	H	H	H
13-54	Me	H	Me	H	H	Me	H	H	H	H	H
13-55	Me	H	Me	H	H	H	Me	H	H	H	H
13-56	Me	H	Me	H	H	H	H	Me	H	H	H
13-57	Me	H	Me	H	H	H	H	H	Me	H	H
13-58	Me	H	Me	H	H	H	H	H	H	Me	H
13-59	Me	H	Me	H	H	H	H	H	H	H	Me
13-60	Me	H	Me	H	H	Ph	H	H	H	H	H
13-61	Me	H	Me	H	H	H	Ph	H	H	H	H
13-62	Me	H	Me	H	H	H	H	Ph	H	H	H
13-63	Me	H	Me	H	H	H	H	H	Ph	H	H
13-64	Me	H	Me	H	H	H	H	H	H	Ph	H
13-65	Me	H	Me	H	H	H	H	H	H	H	Ph

TABLE 13-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
13-66	Ph	H	Me	H	H	H	H	H	H	H	H
13-67	Ph	H	Me	H	H	Me	H	H	H	H	H
13-68	Ph	H	Me	H	H	H	Me	H	H	H	H
13-69	Ph	H	Me	H	H	H	H	Me	H	H	H
13-70	Ph	H	Me	H	H	H	H	H	Me	H	H
13-71	Ph	H	Me	H	H	H	H	H	H	Me	H
13-72	Ph	H	Me	H	H	H	H	H	H	H	Me
13-73	Ph	H	Me	H	H	Ph	H	H	H	H	H
13-74	Ph	H	Me	H	H	H	Ph	H	H	H	H
13-75	Ph	H	Me	H	H	H	H	Ph	H	H	H
13-76	Ph	H	Me	H	H	H	H	H	Ph	H	H
13-77	Ph	H	Me	H	H	H	H	H	H	Ph	H
13-78	Ph	H	Me	H	H	H	H	H	H	H	Ph
13-79	Me	H	H	Me	H	H	H	H	H	H	H
13-80	Me	H	H	Me	H	Me	H	H	H	H	H
13-81	Me	H	H	Me	H	H	Me	H	H	H	H
13-82	Me	H	H	Me	H	H	H	Me	H	H	H
13-83	Me	H	H	Me	H	H	H	H	Me	H	H
13-84	Me	H	H	Me	H	H	H	H	H	Me	H
13-85	Me	H	H	Me	H	H	H	H	H	H	Me
13-86	Me	H	H	Me	H	Ph	H	H	H	H	H
13-87	Me	H	H	Me	H	H	Ph	H	H	H	H
13-88	Me	H	H	Me	H	H	H	Ph	H	H	H
13-89	Me	H	H	Me	H	H	H	H	Ph	H	H
13-90	Me	H	H	Me	H	H	H	H	H	Ph	H
13-91	Me	H	H	Me	H	H	H	H	H	H	Ph
13-92	Ph	H	H	Me	H	H	H	H	H	H	H
13-93	Ph	H	H	Me	H	Me	H	H	H	H	H
13-94	Ph	H	H	Me	H	H	Me	H	H	H	H
13-95	Ph	H	H	Me	H	H	H	Me	H	H	H
13-96	Ph	H	H	Me	H	H	H	H	Me	H	H
13-97	Ph	H	H	Me	H	H	H	H	H	Me	H
13-98	Ph	H	H	Me	H	H	H	H	H	H	Me
13-99	Ph	H	H	Me	H	Ph	H	H	H	H	H
13-100	Ph	H	H	Me	H	H	Ph	H	H	H	H
13-101	Ph	H	H	Me	H	H	H	Ph	H	H	H
13-102	Ph	H	H	Me	H	H	H	H	Ph	H	H
13-103	Ph	H	H	Me	H	H	H	H	H	Ph	H
13-104	Ph	H	H	Me	H	H	H	H	H	H	Ph
13-105	Me	H	H	H	Me	H	H	H	H	H	H
13-106	Me	H	H	H	Me	Me	H	H	H	H	H
13-107	Me	H	H	H	Me	H	Me	H	H	H	H
13-108	Me	H	H	H	Me	H	H	Me	H	H	H
13-109	Me	H	H	H	Me	H	H	H	Me	H	H
13-110	Me	H	H	H	Me	H	H	H	H	Me	H
13-111	Me	H	H	H	Me	H	H	H	H	H	Me
13-112	Me	H	H	H	Me	Ph	H	H	H	H	H
13-113	Me	H	H	H	Me	H	Ph	H	H	H	H
13-114	Me	H	H	H	Me	H	H	Ph	H	H	H
13-115	Me	H	H	H	Me	H	H	H	Ph	H	H
13-116	Me	H	H	H	Me	H	H	H	H	Ph	H
13-117	Me	H	H	H	Me	H	H	H	H	H	Ph
13-118	Ph	H	H	H	Me	H	H	H	H	H	H
13-119	Ph	H	H	H	Me	Me	H	H	H	H	H
13-120	Ph	H	H	H	Me	H	Me	H	H	H	H
13-121	Ph	H	H	H	Me	H	H	Me	H	H	H
13-122	Ph	H	H	H	Me	H	H	H	Me	H	H
13-123	Ph	H	H	H	Me	H	H	H	H	Me	H
13-124	Ph	H	H	H	Me	H	H	H	H	H	Me
13-125	Ph	H	H	H	Me	Ph	H	H	H	H	H
13-126	Ph	H	H	H	Me	H	Ph	H	H	H	H
13-127	Ph	H	H	H	Me	H	H	Ph	H	H	H
13-128	Ph	H	H	H	Me	H	H	H	Ph	H	H
13-129	Ph	H	H	H	Me	H	H	H	H	Ph	H
13-130	Ph	H	H	H	Me	H	H	H	H	H	Ph
13-131	Me	Ph	H	H	H	H	H	H	H	H	H
13-132	Me	Ph	H	H	H	Me	H	H	H	H	H
13-133	Me	Ph	H	H	H	H	Me	H	H	H	H
13-134	Me	Ph	H	H	H	H	H	Me	H	H	H
13-135	Me	Ph	H	H	H	H	H	H	Me	H	H
13-136	Me	Ph	H	H	H	H	H	H	H	Me	H
13-137	Me	Ph	H	H	H	H	H	H	H	H	Me
13-138	Me	Ph	H	H	H	Ph	H	H	H	H	H
13-139	Me	Ph	H	H	H	H	Ph	H	H	H	H
13-140	Me	Ph	H	H	H	H	H	Ph	H	H	H
13-141	Me	Ph	H	H	H	H	H	H	Ph	H	H
13-142	Me	Ph	H	H	H	H	H	H	H	Ph	H
13-143	Me	Ph	H	H	H	H	H	H	H	H	Ph

TABLE 13-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
13-144	Ph	Ph	H	H	H	H	H	H	H	H	H
13-145	Ph	Ph	H	H	H	Me	H	H	H	H	H
13-146	Ph	Ph	H	H	H	H	Me	H	H	H	H
13-147	Ph	Ph	H	H	H	H	H	Me	H	H	H
13-148	Ph	Ph	H	H	H	H	H	H	Me	H	H
13-149	Ph	Ph	H	H	H	H	H	H	H	Me	H
13-150	Ph	Ph	H	H	H	H	H	H	H	H	Me
13-151	Ph	Ph	H	H	H	Ph	H	H	H	H	H
13-152	Ph	Ph	H	H	H	H	Ph	H	H	H	H
13-153	Ph	Ph	H	H	H	H	H	Ph	H	H	H
13-154	Ph	Ph	H	H	H	H	H	H	Ph	H	H
13-155	Ph	Ph	H	H	H	H	H	H	H	Ph	H
13-156	Ph	Ph	H	H	H	H	H	H	H	H	Ph
13-157	Me	H	Ph	H	H	H	H	H	H	H	H
13-158	Me	H	Ph	H	H	Me	H	H	H	H	H
13-159	Me	H	Ph	H	H	H	Me	H	H	H	H
13-160	Me	H	Ph	H	H	H	H	Me	H	H	H
13-161	Me	H	Ph	H	H	H	H	H	Me	H	H
13-162	Me	H	Ph	H	H	H	H	H	H	Me	H
13-163	Me	H	Ph	H	H	H	H	H	H	H	Me
13-164	Me	H	Ph	H	H	Ph	H	H	H	H	H
13-165	Me	H	Ph	H	H	H	Ph	H	H	H	H
13-166	Me	H	Ph	H	H	H	H	Ph	H	H	H
13-167	Me	H	Ph	H	H	H	H	H	Ph	H	H
13-168	Me	H	Ph	H	H	H	H	H	H	Ph	H
13-169	Me	H	Ph	H	H	H	H	H	H	H	Ph
13-170	Ph	H	Ph	H	H	H	H	H	H	H	H
13-171	Ph	H	Ph	H	H	Me	H	H	H	H	H
13-172	Ph	H	Ph	H	H	H	Me	H	H	H	H
13-173	Ph	H	Ph	H	H	H	H	Me	H	H	H
13-174	Ph	H	Ph	H	H	H	H	H	Me	H	H
13-175	Ph	H	Ph	H	H	H	H	H	H	Me	H
13-176	Ph	H	Ph	H	H	H	H	H	H	H	Me
13-177	Ph	H	Ph	H	H	Ph	H	H	H	H	H
13-178	Ph	H	Ph	H	H	H	Ph	H	H	H	H
13-179	Ph	H	Ph	H	H	H	H	Ph	H	H	H
13-180	Ph	H	Ph	H	H	H	H	H	Ph	H	H
13-181	Ph	H	Ph	H	H	H	H	H	H	Ph	H
13-182	Ph	H	Ph	H	H	H	H	H	H	H	Ph
13-183	Me	H	H	Ph	H	H	H	H	H	H	H
13-184	Me	H	H	Ph	H	Me	H	H	H	H	H
13-185	Me	H	H	Ph	H	H	Me	H	H	H	H
13-186	Me	H	H	Ph	H	H	H	Me	H	H	H
13-187	Me	H	H	Ph	H	H	H	H	Me	H	H
13-188	Me	H	H	Ph	H	H	H	H	H	Me	H
13-189	Me	H	H	Ph	H	H	H	H	H	H	Me
13-190	Me	H	H	Ph	H	Ph	H	H	H	H	H
13-191	Me	H	H	Ph	H	H	Ph	H	H	H	H
13-192	Me	H	H	Ph	H	H	H	Ph	H	H	H
13-193	Me	H	H	Ph	H	H	H	H	Ph	H	H
13-194	Me	H	H	Ph	H	H	H	H	H	Ph	H
13-195	Me	H	H	Ph	H	H	H	H	H	H	Ph
13-196	Ph	H	H	Ph	H	H	H	H	H	H	H
13-197	Ph	H	H	Ph	H	Me	H	H	H	H	H
13-198	Ph	H	H	Ph	H	H	Me	H	H	H	H
13-199	Ph	H	H	Ph	H	H	H	Me	H	H	H
13-200	Ph	H	H	Ph	H	H	H	H	Me	H	H
13-201	Ph	H	H	Ph	H	H	H	H	H	Me	H
13-202	Ph	H	H	Ph	H	H	H	H	H	H	Me
13-203	Ph	H	H	Ph	H	Ph	H	H	H	H	H
13-204	Ph	H	H	Ph	H	H	Ph	H	H	H	H
13-205	Ph	H	H	Ph	H	H	H	Ph	H	H	H
13-206	Ph	H	H	Ph	H	H	H	H	Ph	H	H
13-207	Ph	H	H	Ph	H	H	H	H	H	Ph	H
13-208	Ph	H	H	Ph	H	H	H	H	H	H	Ph
13-209	Me	H	H	H	Ph	H	H	H	H	H	H
13-210	Me	H	H	H	Ph	Me	H	H	H	H	H
13-211	Me	H	H	H	Ph	H	Me	H	H	H	H
13-212	Me	H	H	H	Ph	H	H	Me	H	H	H
13-213	Me	H	H	H	Ph	H	H	H	Me	H	H
13-214	Me	H	H	H	Ph	H	H	H	H	Me	H
13-215	Me	H	H	H	Ph	H	H	H	H	H	Me
13-216	Me	H	H	H	Ph	Ph	H	H	H	H	H
13-217	Me	H	H	H	Ph	H	Ph	H	H	H	H
13-218	Me	H	H	H	Ph	H	H	Ph	H	H	H
13-219	Me	H	H	H	Ph	H	H	H	Ph	H	H
13-220	Me	H	H	H	Ph	H	H	H	H	Ph	H
13-221	Me	H	H	H	Ph	H	H	H	H	H	Ph

TABLE 13-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6
13-222	Ph	H	H	H	Ph	H	H	H	H	H	H
13-223	Ph	H	H	H	Ph	Me	H	H	H	H	H
13-224	Ph	H	H	H	Ph	H	Me	H	H	H	H
13-225	Ph	H	H	H	Ph	H	H	Me	H	H	H
13-226	Ph	H	H	H	Ph	H	H	H	Me	H	H
13-227	Ph	H	H	H	Ph	H	H	H	H	Me	H
13-228	Ph	H	H	H	Ph	H	H	H	H	H	Me
13-229	Ph	H	H	H	Ph	Ph	H	H	H	H	H
13-230	Ph	H	H	H	Ph	H	Ph	H	H	H	H
13-231	Ph	H	H	H	Ph	H	H	Ph	H	H	H
13-232	Ph	H	H	H	Ph	H	H	H	Ph	H	H
13-233	Ph	H	H	H	Ph	H	H	H	H	Ph	H
13-234	Ph	H	H	H	Ph	H	H	H	H	H	Ph

TABLE 14

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
14-1	Me	H	H	H	H	H	H	H	H	H	H	Me
14-2	Me	H	H	H	H	Me	H	H	H	H	H	Me
14-3	Me	H	H	H	H	H	Me	H	H	H	H	Me
14-4	Me	H	H	H	H	H	H	Me	H	H	H	Me
14-5	Me	H	H	H	H	H	H	H	Me	H	H	Me
14-6	Me	H	H	H	H	H	H	H	H	Me	H	Me
14-7	Me	H	H	H	H	H	H	H	H	H	Me	Me
14-8	Me	H	H	H	H	Ph	H	H	H	H	H	Me
14-9	Me	H	H	H	H	H	Ph	H	H	H	H	Me
14-10	Me	H	H	H	H	H	H	Ph	H	H	H	Me
14-11	Me	H	H	H	H	H	H	H	Ph	H	H	Me
14-12	Me	H	H	H	H	H	H	H	H	Ph	H	Me
14-13	Me	H	H	H	H	H	H	H	H	H	Ph	Me
14-14	Ph	H	H	H	H	H	H	H	H	H	H	Me
14-15	Ph	H	H	H	H	Me	H	H	H	H	H	Me
14-16	Ph	H	H	H	H	H	Me	H	H	H	H	Me
14-17	Ph	H	H	H	H	H	H	Me	H	H	H	Me
14-18	Ph	H	H	H	H	H	H	H	Me	H	H	Me
14-19	Ph	H	H	H	H	H	H	H	H	Me	H	Me
14-20	Ph	H	H	H	H	H	H	H	H	H	Me	Me
14-21	Ph	H	H	H	H	Ph	H	H	H	H	H	Me
14-22	Ph	H	H	H	H	H	Ph	H	H	H	H	Me
14-23	Ph	H	H	H	H	H	H	Ph	H	H	H	Me
14-24	Ph	H	H	H	H	H	H	H	Ph	H	H	Me
14-25	Ph	H	H	H	H	H	H	H	H	Ph	H	Me
14-26	Ph	H	H	H	H	H	H	H	H	H	Ph	Me
14-27	Me	Me	H	H	H	H	H	H	H	H	H	Me
14-28	Me	Me	H	H	H	Me	H	H	H	H	H	Me
14-29	Me	Me	H	H	H	H	Me	H	H	H	H	Me
14-30	Me	Me	H	H	H	H	H	Me	H	H	H	Me
14-31	Me	Me	H	H	H	H	H	H	Me	H	H	Me
14-32	Me	Me	H	H	H	H	H	H	H	Me	H	Me
14-33	Me	Me	H	H	H	H	H	H	H	H	Me	Me
14-34	Me	Me	H	H	H	Ph	H	H	H	H	H	Me
14-35	Me	Me	H	H	H	H	Ph	H	H	H	H	Me
14-36	Me	Me	H	H	H	H	H	Ph	H	H	H	Me
14-37	Me	Me	H	H	H	H	H	H	Ph	H	H	Me
14-38	Me	Me	H	H	H	H	H	H	H	Ph	H	Me
14-39	Me	Me	H	H	H	H	H	H	H	H	Ph	Me
14-40	Ph	Me	H	H	H	H	H	H	H	H	H	Me
14-41	Ph	Me	H	H	H	Me	H	H	H	H	H	Me
14-42	Ph	Me	H	H	H	H	Me	H	H	H	H	Me
14-43	Ph	Me	H	H	H	H	H	Me	H	H	H	Me
14-44	Ph	Me	H	H	H	H	H	H	Me	H	H	Me
14-45	Ph	Me	H	H	H	H	H	H	H	Me	H	Me
14-46	Ph	Me	H	H	H	H	H	H	H	H	Me	Me
14-47	Ph	Me	H	H	H	Ph	H	H	H	H	H	Me
14-48	Ph	Me	H	H	H	H	Ph	H	H	H	H	Me
14-49	Ph	Me	H	H	H	H	H	Ph	H	H	H	Me
14-50	Ph	Me	H	H	H	H	H	H	Ph	H	H	Me
14-51	Ph	Me	H	H	H	H	H	H	H	Ph	H	Me
14-52	Ph	Me	H	H	H	H	H	H	H	H	Ph	Me
14-53	Me	H	Me	H	H	H	H	H	H	H	H	Me
14-54	Me	H	Me	H	H	Me	H	H	H	H	H	Me
14-55	Me	H	Me	H	H	H	Me	H	H	H	H	Me
14-56	Me	H	Me	H	H	H	H	Me	H	H	H	Me
14-57	Me	H	Me	H	H	H	H	H	Me	H	H	Me

TABLE 14-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
14-58	Me	H	Me	H	H	H	H	H	H	Me	H	Me
14-59	Me	H	Me	H	H	H	H	H	H	H	Me	Me
14-60	Me	H	Me	H	H	Ph	H	H	H	H	H	Me
14-61	Me	H	Me	H	H	H	Ph	H	H	H	H	Me
14-62	Me	H	Me	H	H	H	H	Ph	H	H	H	Me
14-63	Me	H	Me	H	H	H	H	H	Ph	H	H	Me
14-64	Me	H	Me	H	H	H	H	H	H	Ph	H	Me
14-65	Me	H	Me	H	H	H	H	H	H	H	Ph	Me
14-66	Ph	H	Me	H	H	H	H	H	H	H	H	Me
14-67	Ph	H	Me	H	H	Me	H	H	H	H	H	Me
14-68	Ph	H	Me	H	H	H	Me	H	H	H	H	Me
14-69	Ph	H	Me	H	H	H	H	Me	H	H	H	Me
14-70	Ph	H	Me	H	H	H	H	H	Me	H	H	Me
14-71	Ph	H	Me	H	H	H	H	H	H	Me	H	Me
14-72	Ph	H	Me	H	H	H	H	H	H	H	Me	Me
14-73	Ph	H	Me	H	H	Ph	H	H	H	H	H	Me
14-74	Ph	H	Me	H	H	H	Ph	H	H	H	H	Me
14-75	Ph	H	Me	H	H	H	H	Ph	H	H	H	Me
14-76	Ph	H	Me	H	H	H	H	H	Ph	H	H	Me
14-77	Ph	H	Me	H	H	H	H	H	H	Ph	H	Me
14-78	Ph	H	Me	H	H	H	H	H	H	H	Ph	Me
14-79	Me	H	H	Me	H	H	H	H	H	H	H	Me
14-80	Me	H	H	Me	H	Me	H	H	H	H	H	Me
14-81	Me	H	H	Me	H	H	Me	H	H	H	H	Me
14-82	Me	H	H	Me	H	H	H	Me	H	H	H	Me
14-83	Me	H	H	Me	H	H	H	H	Me	H	H	Me
14-84	Me	H	H	Me	H	H	H	H	H	Me	H	Me
14-85	Me	H	H	Me	H	H	H	H	H	H	Me	Me
14-86	Me	H	H	Me	H	Ph	H	H	H	H	H	Me
14-87	Me	H	H	Me	H	H	Ph	H	H	H	H	Me
14-88	Me	H	H	Me	H	H	H	Ph	H	H	H	Me
14-89	Me	H	H	Me	H	H	H	H	Ph	H	H	Me
14-90	Me	H	H	Me	H	H	H	H	H	Ph	H	Me
14-91	Me	H	H	Me	H	H	H	H	H	H	Ph	Me
14-92	Ph	H	H	Me	H	H	H	H	H	H	H	Me
14-93	Ph	H	H	Me	H	Me	H	H	H	H	H	Me
14-94	Ph	H	H	Me	H	H	Me	H	H	H	H	Me
14-95	Ph	H	H	Me	H	H	H	Me	H	H	H	Me
14-96	Ph	H	H	Me	H	H	H	H	Me	H	H	Me
14-97	Ph	H	H	Me	H	H	H	H	H	Me	H	Me
14-98	Ph	H	H	Me	H	H	H	H	H	H	Me	Me
14-99	Ph	H	H	Me	H	Ph	H	H	H	H	H	Me
14-100	Ph	H	H	Me	H	H	Ph	H	H	H	H	Me
14-101	Ph	H	H	Me	H	H	H	Ph	H	H	H	Me
14-102	Ph	H	H	Me	H	H	H	H	Ph	H	H	Me
14-103	Ph	H	H	Me	H	H	H	H	H	Ph	H	Me
14-104	Ph	H	H	Me	H	H	H	H	H	H	Ph	Me
14-105	Me	H	H	H	Me	H	H	H	H	H	H	Me
14-106	Me	H	H	H	Me	Me	H	H	H	H	H	Me
14-107	Me	H	H	H	Me	H	Me	H	H	H	H	Me
14-108	Me	H	H	H	Me	H	H	Me	H	H	H	Me
14-109	Me	H	H	H	Me	H	H	H	Me	H	H	Me
14-110	Me	H	H	H	Me	H	H	H	H	Me	H	Me
14-111	Me	H	H	H	Me	H	H	H	H	H	Me	Me
14-112	Me	H	H	H	Me	Ph	H	H	H	H	H	Me
14-113	Me	H	H	H	Me	H	Ph	H	H	H	H	Me
14-114	Me	H	H	H	Me	H	H	Ph	H	H	H	Me
14-115	Me	H	H	H	Me	H	H	H	Ph	H	H	Me
14-116	Me	H	H	H	Me	H	H	H	H	Ph	H	Me
14-117	Me	H	H	H	Me	H	H	H	H	H	Ph	Me
14-118	Ph	H	H	H	Me	H	H	H	H	H	H	Me
14-119	Ph	H	H	H	Me	Me	H	H	H	H	H	Me
14-120	Ph	H	H	H	Me	H	Me	H	H	H	H	Me
14-121	Ph	H	H	H	Me	H	H	Me	H	H	H	Me
14-122	Ph	H	H	H	Me	H	H	H	Me	H	H	Me
14-123	Ph	H	H	H	Me	H	H	H	H	Me	H	Me
14-124	Ph	H	H	H	Me	H	H	H	H	H	Me	Me
14-125	Ph	H	H	H	Me	Ph	H	H	H	H	H	Me
14-126	Ph	H	H	H	Me	H	Ph	H	H	H	H	Me
14-127	Ph	H	H	H	Me	H	H	Ph	H	H	H	Me
14-128	Ph	H	H	H	Me	H	H	H	Ph	H	H	Me
14-129	Ph	H	H	H	Me	H	H	H	H	Ph	H	Me
14-130	Ph	H	H	H	Me	H	H	H	H	H	Ph	Me
14-131	Me	Ph	H	H	H	H	H	H	H	H	H	Me
14-132	Me	Ph	H	H	H	Me	H	H	H	H	H	Me
14-133	Me	Ph	H	H	H	H	Me	H	H	H	H	Me
14-134	Me	Ph	H	H	H	H	H	Me	H	H	H	Me
14-135	Me	Ph	H	H	H	H	H	H	Me	H	H	Me

TABLE 14-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
14-136	Me	Ph	H	H	H	H	H	H	H	Me	H	Me
14-137	Me	Ph	H	H	H	H	H	H	H	H	Me	Me
14-138	Me	Ph	H	H	H	Ph	H	H	H	H	H	Me
14-139	Me	Ph	H	H	H	H	Ph	H	H	H	H	Me
14-140	Me	Ph	H	H	H	H	H	Ph	H	H	H	Me
14-141	Me	Ph	H	H	H	H	H	H	Ph	H	H	Me
14-142	Me	Ph	H	H	H	H	H	H	H	Ph	H	Me
14-143	Me	Ph	H	H	H	H	H	H	H	H	Ph	Me
14-144	Ph	Ph	H	H	H	H	H	H	H	H	H	Me
14-145	Ph	Ph	H	H	H	Me	H	H	H	H	H	Me
14-146	Ph	Ph	H	H	H	H	Me	H	H	H	H	Me
14-147	Ph	Ph	H	H	H	H	H	Me	H	H	H	Me
14-148	Ph	Ph	H	H	H	H	H	H	Me	H	H	Me
14-149	Ph	Ph	H	H	H	H	H	H	H	Me	H	Me
14-150	Ph	Ph	H	H	H	H	H	H	H	H	Me	Me
14-151	Ph	Ph	H	H	H	Ph	H	H	H	H	H	Me
14-152	Ph	Ph	H	H	H	H	Ph	H	H	H	H	Me
14-153	Ph	Ph	H	H	H	H	H	Ph	H	H	H	Me
14-154	Ph	Ph	H	H	H	H	H	H	Ph	H	H	Me
14-155	Ph	Ph	H	H	H	H	H	H	H	Ph	H	Me
14-156	Ph	Ph	H	H	H	H	H	H	H	H	Ph	Me
14-157	Me	H	Ph	H	H	H	H	H	H	H	H	Me
14-158	Me	H	Ph	H	H	Me	H	H	H	H	H	Me
14-159	Me	H	Ph	H	H	H	Me	H	H	H	H	Me
14-160	Me	H	Ph	H	H	H	H	Me	H	H	H	Me
14-161	Me	H	Ph	H	H	H	H	H	Me	H	H	Me
14-162	Me	H	Ph	H	H	H	H	H	H	Me	H	Me
14-163	Me	H	Ph	H	H	H	H	H	H	H	Me	Me
14-164	Me	H	Ph	H	H	Ph	H	H	H	H	H	Me
14-165	Me	H	Ph	H	H	H	Ph	H	H	H	H	Me
14-166	Me	H	Ph	H	H	H	H	Ph	H	H	H	Me
14-167	Me	H	Ph	H	H	H	H	H	Ph	H	H	Me
14-168	Me	H	Ph	H	H	H	H	H	H	Ph	H	Me
14-169	Me	H	Ph	H	H	H	H	H	H	H	Ph	Me
14-170	Ph	H	Ph	H	H	H	H	H	H	H	H	Me
14-171	Ph	H	Ph	H	H	Me	H	H	H	H	H	Me
14-172	Ph	H	Ph	H	H	H	Me	H	H	H	H	Me
14-173	Ph	H	Ph	H	H	H	H	Me	H	H	H	Me
14-174	Ph	H	Ph	H	H	H	H	H	Me	H	H	Me
14-175	Ph	H	Ph	H	H	H	H	H	H	Me	H	Me
14-176	Ph	H	Ph	H	H	H	H	H	H	H	Me	Me
14-177	Ph	H	Ph	H	H	Ph	H	H	H	H	H	Me
14-178	Ph	H	Ph	H	H	H	Ph	H	H	H	H	Me
14-179	Ph	H	Ph	H	H	H	H	Ph	H	H	H	Me
14-180	Ph	H	Ph	H	H	H	H	H	Ph	H	H	Me
14-181	Ph	H	Ph	H	H	H	H	H	H	Ph	H	Me
14-182	Ph	H	Ph	H	H	H	H	H	H	H	Ph	Me
14-183	Me	H	H	Ph	H	H	H	H	H	H	H	Me
14-184	Me	H	H	Ph	H	Me	H	H	H	H	H	Me
14-185	Me	H	H	Ph	H	H	Me	H	H	H	H	Me
14-186	Me	H	H	Ph	H	H	H	Me	H	H	H	Me
14-187	Me	H	H	Ph	H	H	H	H	Me	H	H	Me
14-188	Me	H	H	Ph	H	H	H	H	H	Me	H	Me
14-189	Me	H	H	Ph	H	H	H	H	H	H	Me	Me
14-190	Me	H	H	Ph	H	Ph	H	H	H	H	H	Me
14-191	Me	H	H	Ph	H	H	Ph	H	H	H	H	Me
14-192	Me	H	H	Ph	H	H	H	Ph	H	H	H	Me
14-193	Me	H	H	Ph	H	H	H	H	Ph	H	H	Me
14-194	Me	H	H	Ph	H	H	H	H	H	Ph	H	Me
14-195	Me	H	H	Ph	H	H	H	H	H	H	Ph	Me
14-196	Ph	H	H	Ph	H	H	H	H	H	H	H	Me
14-197	Ph	H	H	Ph	H	Me	H	H	H	H	H	Me
14-198	Ph	H	H	Ph	H	H	Me	H	H	H	H	Me
14-199	Ph	H	H	Ph	H	H	H	Me	H	H	H	Me
14-200	Ph	H	H	Ph	H	H	H	H	Me	H	H	Me
14-201	Ph	H	H	Ph	H	H	H	H	H	Me	H	Me
14-202	Ph	H	H	Ph	H	H	H	H	H	H	Me	Me
14-203	Ph	H	H	Ph	H	Ph	H	H	H	H	H	Me
14-204	Ph	H	H	Ph	H	H	Ph	H	H	H	H	Me
14-205	Ph	H	H	Ph	H	H	H	Ph	H	H	H	Me
14-206	Ph	H	H	Ph	H	H	H	H	Ph	H	H	Me
14-207	Ph	H	H	Ph	H	H	H	H	H	Ph	H	Me
14-208	Ph	H	H	Ph	H	H	H	H	H	H	Ph	Me
14-209	Me	H	H	H	Ph	H	H	H	H	H	H	Me
14-210	Me	H	H	H	Ph	Me	H	H	H	H	H	Me
14-211	Me	H	H	H	Ph	H	Me	H	H	H	H	Me
14-212	Me	H	H	H	Ph	H	H	Me	H	H	H	Me
14-213	Me	H	H	H	Ph	H	H	H	Me	H	H	Me

TABLE 14-continued

Cpd No.	Ra1	Ra2	Ra3	Rb4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7
14-214	Me	H	H	H	Ph	H	H	H	H	Me	H	Me
14-215	Me	H	H	H	Ph	H	H	H	H	H	Me	Me
14-216	Me	H	H	H	Ph	Ph	H	H	H	H	H	Me
14-217	Me	H	H	H	Ph	H	Ph	H	H	H	H	Me
14-218	Me	H	H	H	Ph	H	H	Ph	H	H	H	Me
14-219	Me	H	H	H	Ph	H	H	H	Ph	H	H	Me
14-220	Me	H	H	H	Ph	H	H	H	H	Ph	H	Me
14-221	Me	H	H	H	Ph	H	H	H	H	H	Ph	Me
14-222	Ph	H	H	H	Ph	H	H	H	H	H	H	Me
14-223	Ph	H	H	H	Ph	Me	H	H	H	H	H	Me
14-224	Ph	H	H	H	Ph	H	Me	H	H	H	H	Me
14-225	Ph	H	H	H	Ph	H	H	Me	H	H	H	Me
14-226	Ph	H	H	H	Ph	H	H	H	Me	H	H	Me
14-227	Ph	H	H	H	Ph	H	H	H	H	Me	H	Me
14-228	Ph	H	H	H	Ph	H	H	H	H	H	Me	Me
14-229	Ph	H	H	H	Ph	Ph	H	H	H	H	H	Me
14-230	Ph	H	H	H	Ph	H	Ph	H	H	H	H	Me
14-231	Ph	H	H	H	Ph	H	H	Ph	H	H	H	Me
14-232	Ph	H	H	H	Ph	H	H	H	Ph	H	H	Me
14-233	Ph	H	H	H	Ph	H	H	H	H	Ph	H	Me
14-234	Ph	H	H	H	Ph	H	H	H	H	H	Ph	Me

TABLE 15

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
15-1	Me	H	H	H	H	H	H	H	H	H	H	H	H
15-2	Me	H	H	H	H	Me	H	H	H	H	H	H	H
15-3	Me	H	H	H	H	H	Me	H	H	H	H	H	H
15-4	Me	H	H	H	H	H	H	Me	H	H	H	H	H
15-5	Me	H	H	H	H	H	H	H	Me	H	H	H	H
15-6	Me	H	H	H	H	H	H	H	H	Me	H	H	H
15-7	Me	H	H	H	H	H	H	H	H	H	Me	H	H
15-8	Me	H	H	H	H	H	H	H	H	H	H	Me	H
15-9	Me	H	H	H	H	H	H	H	H	H	H	H	Me
15-10	Me	H	H	H	H	Ph	H	H	H	H	H	H	H
15-11	Me	H	H	H	H	H	Ph	H	H	H	H	H	H
15-12	Me	H	H	H	H	H	H	Ph	H	H	H	H	H
15-13	Me	H	H	H	H	H	H	H	Ph	H	H	H	H
15-14	Me	H	H	H	H	H	H	H	H	Ph	H	H	H
15-15	Me	H	H	H	H	H	H	H	H	H	Ph	H	H
15-16	Me	H	H	H	H	H	H	H	H	H	H	Ph	H
15-17	Me	H	H	H	H	H	H	H	H	H	H	H	Ph
15-18	Ph	H	H	H	H	H	H	H	H	H	H	H	H
15-19	Ph	H	H	H	H	Me	H	H	H	H	H	H	H
15-20	Ph	H	H	H	H	H	Me	H	H	H	H	H	H
15-21	Ph	H	H	H	H	H	H	Me	H	H	H	H	H
15-22	Ph	H	H	H	H	H	H	H	Me	H	H	H	H
15-23	Ph	H	H	H	H	H	H	H	H	Me	H	H	H
15-24	Ph	H	H	H	H	H	H	H	H	H	Me	H	H
15-25	Ph	H	H	H	H	H	H	H	H	H	H	Me	H
15-26	Ph	H	H	H	H	H	H	H	H	H	H	H	Me
15-27	Ph	H	H	H	H	Ph	H	H	H	H	H	H	H
15-28	Ph	H	H	H	H	H	Ph	H	H	H	H	H	H
15-29	Ph	H	H	H	H	H	H	Ph	H	H	H	H	H
15-30	Ph	H	H	H	H	H	H	H	Ph	H	H	H	H
15-31	Ph	H	H	H	H	H	H	H	H	Ph	H	H	H
15-32	Ph	H	H	H	H	H	H	H	H	H	Ph	H	H
15-33	Ph	H	H	H	H	H	H	H	H	H	H	Ph	H
15-34	Ph	H	H	H	H	H	H	H	H	H	H	H	Ph
15-35	Me	Me	H	H	H	H	H	H	H	H	H	H	H
15-36	Me	Me	H	H	H	Me	H	H	H	H	H	H	H
15-37	Me	Me	H	H	H	H	Me	H	H	H	H	H	H
15-38	Me	Me	H	H	H	H	H	Me	H	H	H	H	H
15-39	Me	Me	H	H	H	H	H	H	Me	H	H	H	H
15-40	Me	Me	H	H	H	H	H	H	H	Me	H	H	H
15-41	Me	Me	H	H	H	H	H	H	H	H	Me	H	H
15-42	Me	Me	H	H	H	H	H	H	H	H	H	Me	H
15-43	Me	Me	H	H	H	H	H	H	H	H	H	H	Me
15-44	Me	Me	H	H	H	Ph	H	H	H	H	H	H	H
15-45	Me	Me	H	H	H	H	Ph	H	H	H	H	H	H
15-46	Me	Me	H	H	H	H	H	Ph	H	H	H	H	H
15-47	Me	Me	H	H	H	H	H	H	Ph	H	H	H	H
15-48	Me	Me	H	H	H	H	H	H	H	Ph	H	H	H
15-49	Me	Me	H	H	H	H	H	H	H	H	Ph	H	H

TABLE 15-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
15-50	Me	Me	H	H	H	H	H	H	H	H	H	Ph	H
15-51	Me	Me	H	H	H	H	H	H	H	H	H	H	Ph
15-52	Ph	Me	H	H	H	H	H	H	H	H	H	H	H
15-53	Ph	Me	H	H	H	Me	H	H	H	H	H	H	H
15-54	Ph	Me	H	H	H	H	Me	H	H	H	H	H	H
15-55	Ph	Me	H	H	H	H	H	Me	H	H	H	H	H
15-56	Ph	Me	H	H	H	H	H	H	Me	H	H	H	H
15-57	Ph	Me	H	H	H	H	H	H	H	Me	H	H	H
15-58	Ph	Me	H	H	H	H	H	H	H	H	Me	H	H
15-59	Ph	Me	H	H	H	H	H	H	H	H	H	Me	H
15-60	Ph	Me	H	H	H	H	H	H	H	H	H	H	Me
15-61	Ph	Me	H	H	H	Ph	H	H	H	H	H	H	H
15-62	Ph	Me	H	H	H	H	Ph	H	H	H	H	H	H
15-63	Ph	Me	H	H	H	H	H	Ph	H	H	H	H	H
15-64	Ph	Me	H	H	H	H	H	H	Ph	H	H	H	H
15-65	Ph	Me	H	H	H	H	H	H	H	Ph	H	H	H
15-66	Ph	Me	H	H	H	H	H	H	H	H	Ph	H	H
15-67	Ph	Me	H	H	H	H	H	H	H	H	H	Ph	H
15-68	Ph	Me	H	H	H	H	H	H	H	H	H	H	Ph
15-69	Me	H	Me	H	H	H	H	H	H	H	H	H	H
15-70	Me	H	Me	H	H	Me	H	H	H	H	H	H	H
15-71	Me	H	Me	H	H	H	Me	H	H	H	H	H	H
15-72	Me	H	Me	H	H	H	H	Me	H	H	H	H	H
15-73	Me	H	Me	H	H	H	H	H	Me	H	H	H	H
15-74	Me	H	Me	H	H	H	H	H	H	Me	H	H	H
15-75	Me	H	Me	H	H	H	H	H	H	H	Me	H	H
15-76	Me	H	Me	H	H	H	H	H	H	H	H	Me	H
15-77	Me	H	Me	H	H	H	H	H	H	H	H	H	Me
15-78	Me	H	Me	H	H	Ph	H	H	H	H	H	H	H
15-79	Me	H	Me	H	H	H	Ph	H	H	H	H	H	H
15-80	Me	H	Me	H	H	H	H	Ph	H	H	H	H	H
15-81	Me	H	Me	H	H	H	H	H	Ph	H	H	H	H
15-82	Me	H	Me	H	H	H	H	H	H	Ph	H	H	H
15-83	Me	H	Me	H	H	H	H	H	H	H	Ph	H	H
15-84	Me	H	Me	H	H	H	H	H	H	H	H	Ph	H
15-85	Me	H	Me	H	H	H	H	H	H	H	H	H	Ph
15-86	Ph	H	Me	H	H	H	H	H	H	H	H	H	H
15-87	Ph	H	Me	H	H	Me	H	H	H	H	H	H	H
15-88	Ph	H	Me	H	H	H	Me	H	H	H	H	H	H
15-89	Ph	H	Me	H	H	H	H	Me	H	H	H	H	H
15-90	Ph	H	Me	H	H	H	H	H	Me	H	H	H	H
15-91	Ph	H	Me	H	H	H	H	H	H	Me	H	H	H
15-92	Ph	H	Me	H	H	H	H	H	H	H	Me	H	H
15-93	Ph	H	Me	H	H	H	H	H	H	H	H	Me	H
15-94	Ph	H	Me	H	H	H	H	H	H	H	H	H	Me
15-95	Ph	H	Me	H	H	Ph	H	H	H	H	H	H	H
15-96	Ph	H	Me	H	H	H	Ph	H	H	H	H	H	H
15-97	Ph	H	Me	H	H	H	H	Ph	H	H	H	H	H
15-98	Ph	H	Me	H	H	H	H	H	Ph	H	H	H	H
15-99	Ph	H	Me	H	H	H	H	H	H	Ph	H	H	H
15-100	Ph	H	Me	H	H	H	H	H	H	H	Ph	H	H
15-101	Ph	H	Me	H	H	H	H	H	H	H	H	Ph	H
15-102	Ph	H	Me	H	H	H	H	H	H	H	H	H	Ph
15-103	Me	H	H	Me	H	H	H	H	H	H	H	H	H
15-104	Me	H	H	Me	H	Me	H	H	H	H	H	H	H
15-105	Me	H	H	Me	H	H	Me	H	H	H	H	H	H
15-106	Me	H	H	Me	H	H	H	Me	H	H	H	H	H
15-107	Me	H	H	Me	H	H	H	H	Me	H	H	H	H
15-108	Me	H	H	Me	H	H	H	H	H	Me	H	H	H
15-109	Me	H	H	Me	H	H	H	H	H	H	Me	H	H
15-110	Me	H	H	Me	H	H	H	H	H	H	H	Me	H
15-111	Me	H	H	Me	H	H	H	H	H	H	H	H	Me
15-112	Me	H	H	Me	H	Ph	H	H	H	H	H	H	H
15-113	Me	H	H	Me	H	H	Ph	H	H	H	H	H	H
15-114	Me	H	H	Me	H	H	H	Ph	H	H	H	H	H
15-115	Me	H	H	Me	H	H	H	H	Ph	H	H	H	H
15-116	Me	H	H	Me	H	H	H	H	H	Ph	H	H	H
15-117	Me	H	H	Me	H	H	H	H	H	H	Ph	H	H
15-118	Me	H	H	Me	H	H	H	H	H	H	H	Ph	H
15-119	Me	H	H	Me	H	H	H	H	H	H	H	H	Ph
15-120	Ph	H	H	Me	H	H	H	H	H	H	H	H	H
15-121	Ph	H	H	Me	H	Me	H	H	H	H	H	H	H
15-122	Ph	H	H	Me	H	H	Me	H	H	H	H	H	H
15-123	Ph	H	H	Me	H	H	H	Me	H	H	H	H	H
15-124	Ph	H	H	Me	H	H	H	H	Me	H	H	H	H
15-125	Ph	H	H	Me	H	H	H	H	H	Me	H	H	H
15-126	Ph	H	H	Me	H	H	H	H	H	H	Me	H	H
15-127	Ph	H	H	Me	H	H	H	H	H	H	H	Me	H

TABLE 15-continued

Cpd No.	Ra1	Ra2	Ra3	Ra4	Ra5	Rb1	Rb2	Rb3	Rb4	Rb5	Rb6	Rb7	Rb8
15-128	Ph	H	H	Me	H	H	H	H	H	H	H	H	Me
15-129	Ph	H	H	Me	H	Ph	H	H	H	H	H	H	H
15-130	Ph	H	H	Me	H	H	Ph	H	H	H	H	H	H
15-131	Ph	H	H	Me	H	H	H	Ph	H	H	H	H	H
15-132	Ph	H	H	Me	H	H	H	H	Ph	H	H	H	H
15-133	Ph	H	H	Me	H	H	H	H	H	Ph	H	H	H
15-134	Ph	H	H	Me	H	H	H	H	H	H	Ph	H	H
15-135	Ph	H	H	Me	H	H	H	H	H	H	H	Ph	H
15-136	Ph	H	H	Me	H	H	H	H	H	H	H	H	Ph
15-137	Me	H	H	H	Me	H	H	H	H	H	H	H	H
15-138	Me	H	H	H	Me	Me	H	H	H	H	H	H	H
15-139	Me	H	H	H	Me	H	Me	H	H	H	H	H	H
15-140	Me	H	H	H	Me	H	H	Me	H	H	H	H	H
15-141	Me	H	H	H	Me	H	H	H	Me	H	H	H	H
15-142	Me	H	H	H	Me	H	H	H	H	Me	H	H	H
15-143	Me	H	H	H	Me	H	H	H	H	H	Me	H	H
15-144	Me	H	H	H	Me	H	H	H	H	H	H	Me	H
15-145	Me	H	H	H	Me	H	H	H	H	H	H	H	Me
15-146	Me	H	H	H	Me	Ph	H	H	H	H	H	H	H
15-147	Me	H	H	H	Me	H	Ph	H	H	H	H	H	H
15-148	Me	H	H	H	Me	H	H	Ph	H	H	H	H	H
15-149	Me	H	H	H	Me	H	H	H	Ph	H	H	H	H
15-150	Me	H	H	H	Me	H	H	H	H	Ph	H	H	H
15-151	Me	H	H	H	Me	H	H	H	H	H	Ph	H	H
15-152	Me	H	H	H	Me	H	H	H	H	H	H	Ph	H
15-153	Me	H	H	H	Me	H	H	H	H	H	H	H	Ph
15-154	Ph	H	H	H	Me	H	H	H	H	H	H	H	H
15-155	Ph	H	H	H	Me	Me	H	H	H	H	H	H	H
15-156	Ph	H	H	H	Me	H	Me	H	H	H	H	H	H
15-157	Ph	H	H	H	Me	H	H	Me	H	H	H	H	H
15-158	Ph	H	H	H	Me	H	H	H	Me	H	H	H	H
15-159	Ph	H	H	H	Me	H	H	H	H	Me	H	H	H
15-160	Ph	H	H	H	Me	H	H	H	H	H	Me	H	H
15-161	Ph	H	H	H	Me	H	H	H	H	H	H	Me	H
15-162	Ph	H	H	H	Me	H	H	H	H	H	H	H	Me
15-163	Ph	H	H	H	Me	Ph	H	H	H	H	H	H	H
15-164	Ph	H	H	H	Me	H	Ph	H	H	H	H	H	H
15-165	Ph	H	H	H	Me	H	H	Ph	H	H	H	H	H
15-166	Ph	H	H	H	Me	H	H	H	Ph	H	H	H	H
15-167	Ph	H	H	H	Me	H	H	H	H	Ph	H	H	H
15-168	Ph	H	H	H	Me	H	H	H	H	H	Ph	H	H
15-169	Ph	H	H	H	Me	H	H	H	H	H	H	Ph	H
15-170	Ph	H	H	H	Me	H	H	H	H	H	H	H	Ph
15-171	Me	Ph	H	H	H	H	H	H	H	H	H	H	H
15-172	Me	Ph	H	H	H	Me	H	H	H	H	H	H	H
15-173	Me	Ph	H	H	H	H	Me	H	H	H	H	H	H
15-174	Me	Ph	H	H	H	H	H	Me	H	H	H	H	H
15-175	Me	Ph	H	H	H	H	H	H	Me	H	H	H	H
15-176	Me	Ph	H	H	H	H	H	H	H	Me	H	H	H
15-177	Me	Ph	H	H	H	H	H	H	H	H	Me	H	H
15-178	Me	Ph	H	H	H	H	H	H	H	H	H	Me	H
15-179	Me	Ph	H	H	H	H	H	H	H	H	H	H	Me
15-180	Me	Ph	H	H	H	Ph	H	H	H	H	H	H	H
15-181	Me	Ph	H	H	H	H	Ph	H	H	H	H	H	H
15-182	Me	Ph	H	H	H	H	H	Ph	H	H	H	H	H
15-183	Me	Ph	H	H	H	H	H	H	Ph	H	H	H	H
15-184	Me	Ph	H	H	H	H	H	H	H	Ph	H	H	H
15-185	Me	Ph	H	H	H	H	H	H	H	H	Ph	H	H
15-186	Me	Ph	H	H	H	H	H	H	H	H	H	Ph	H
15-187	Me	Ph	H	H	H	H	H	H	H	H	H	H	Ph
15-188	Ph	Ph	H	H	H	H	H	H	H	H	H	H	H
15-189	Ph	Ph	H	H	H	Me	H	H	H	H	H	H	H
15-190	Ph	Ph	H	H	H	H	Me	H	H	H	H	H	H
15-191	Ph	Ph	H	H	H	H	H	Me	H	H	H	H	H
15-192	Ph	Ph	H	H	H	H	H	H	Me	H	H	H	H
15-193	Ph	Ph	H	H	H	H	H	H	H	Me	H	H	H
15-194	Ph	Ph	H	H	H	H	H	H	H	H	Me	H	H
15-195	Ph	Ph	H	H	H	H	H	H	H	H	H	Me	H
15-196	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Me
15-197	Ph	Ph	H	H	H	Ph	H	H	H	H	H	H	H
15-198	Ph	Ph	H	H	H	H	Ph	H	H	H	H	H	H
15-199	Ph	Ph	H	H	H	H	H	Ph	H	H	H	H	H
15-200	Ph	Ph	H	H	H	H	H	H	Ph	H	H	H	H
15-201	Ph	Ph	H	H	H	H	H	H	H	Ph	H	H	H
15-202	Ph	Ph	H	H	H	H	H	H	H	H	Ph	H	H
15-203	Ph	Ph	H	H	H	H	H	H	H	H	H	Ph	H
15-204	Ph	Ph	H	H	H	H	H	H	H	H	H	H	Ph
15-205	Me	H	Ph	H	H	H	H	H	H	H	H	H	H

专利名称(译)	具有卡宾配体的发光化合物		
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申请号	US12/131458	申请日	2008-06-02
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摘要(译)

提供一种有机发光器件。该器件具有阳极，阴极和设置在阳极和阴极之间的有机层。有机层包含化合物，该化合物还包含与金属中心配位的一种或多种卡宾配体。