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- (54)Metal coordination compound, luminescence device and display apparatus
- An electroluminescence device having a layer containing a specific metal coordination compound is provided. The metal coordination compound is represented by formula (1) below:

$$ML_mL'_n$$
 (1),

wherein M is a metal atom of Ir, Pt, Rh or Pd; L and L' are mutually different bidentate ligands; m is 1, 2 or 3 and n is 0, 1 or 2 with the proviso that m+n is 2 or 3; a partial structure MLm is represented by formula (2) shown below and a partial structure ML'_n is represented by formula (3) or (4) shown below:

$$M \begin{cases}
CyN1 \\
CyC1
\end{cases} m (2) M \begin{cases}
CyN2 \\
CyC2
\end{cases} n (3) M \begin{cases}
0 = E \\
0 = G
\end{cases} n (4)$$

at least one of the optional substituent(s) of the cyclic groups, and the cyclic groups CyC1 and CyC2 include an aromatic group capable of having a substituent represented by the following formula (5):

The metal coordination compound having the aromatic group is effective in providing high-efficiency luminescence and long-term high luminance.

Description

FIELD OF THE INVENTION AND RELATED ART

- [0001] The present invention relates to an organic luminescence device (also called an organic electroluminescence device or organic EL device) for use in a planar light source, a planar display, etc. Particularly, the present invention relates to a novel metal coordination compound and a luminescence device having a high luminescence efficiency and causing little change with time by using a metal coordination compound represented by formula (1) appearing hereinafter.
- 10 [0002] An old example of organic luminescence device is, e.g., one using luminescence of a vacuum-deposited anthracene film (Thin Solid Films, 94 (1982) 171). In recent years, however, in view of advantages, such as easiness of providing a large-area device compared with an inorganic luminescence device, and possibility of realizing desired luminescence colors by development of various new materials and drivability at low voltages, an extensive study thereon for device formation as a luminescence device of a high-speed responsiveness and a high efficiency, has been conducted
 - **[0003]** As precisely described in Macromol. Symp. 125, 1 48 (1997), for example, an organic EL device generally has an organization comprising a pair of upper and lower electrodes formed on a transparent substrate, and organic material layers including a luminescence layer disposed between the electrodes.
 - **[0004]** In the luminescence layer, aluminum quinolinol complexes (inclusive of Alq3 shown hereinafter as a representative example) having an electron-transporting characteristic and a luminescence characteristic, are used for example. In a hole-transporting layer, a material having an electron-donative property, such as a triphenyldiamine derivative (inclusive of α -NPD shown hereinafter as a representative example), is used for example.
 - **[0005]** Such a device shows a current-rectifying characteristic such that when an electric field is applied between the electrodes, holes are injected from the anode and electrons are injected from the cathode.
- [0006] The injected holes and electrons are recombined in the luminescence layer to form excitons, which emit luminescence when they are transitioned to the ground state.
 - **[0007]** In this process, the excited states include a singlet state and a triplet state and a transition from the former to the ground state is called fluorescence and a transition from the latter is called phosphorescence. Materials in theses states are called singlet excitons and triplet excitons, respectively.
- [0008] In most of the organic luminescence devices studied heretofore, fluorescence caused by the transition of a singlet exciton to the ground state, has been utilized. On the other hand, in recent years, devices utilizing phosphorescence via triplet excitons have been studied.
 - [0009] Representative published literature may include:
- Article 1: Improved energy transfer in electrophosphorescent device (D.F. O'Brien, et al., Applied Physics Letters, Vol. 74, No. 3, p. 422 (1999)); and
 - Article 2: Very high-efficiency green organic light-emitting devices based on electrophosphorescence (M.A. Baldo, et al., Applied Physics Letters, Vol. 75, No. 1, p. 4 (1999)).
- [0010] In these articles, a structure including four organic layers sandwiched between the electrodes, and the materials used therein include carrier-transporting materials and phosphorescent materials, of which the names and structures are shown below together with their abbreviations.
 - Alg3: aluminum quinolinol complex
 - α-NPD: N4,N4'-di-naphthalene-1-yl-N4,N4'-diphenyl-biphenyl-4,4'-diamine
- 45 CBP: 4,4'-N,N'-dicarbazole-biphenyl
 - BCP: 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline
 - PtOEP: platinum-octaethylporphyrin complex
 - Ir(ppy)₃: iridium-phenylpyrimidine complex

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[0011] The above-mentioned Articles 1 and 2 both have reported structures, as exhibiting a high efficiency, including a hole-transporting layer comprising α -NPD, an electron-transporting layer comprising Alq3, an exciton diffusion-preventing layer comprising BCP, and a luminescence layer comprising CBP as a host and ca. 6 % of PtOEP or Ir(ppy)₃ as a phosphorescent material dispersed in mixture therein.

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PtOEP

[0012] Such a phosphorescent material is particularly noted at present because it is expected to provide a high luminescence efficiency in principle for the following reasons. More specifically, excitons formed by carrier recombination comprise singlet excitons and triplet excitons in a probability ratio of 1:3. Conventional organic EL devices have utilized fluorescence of which the luminescence efficiency is limited to at most 25 %. On the other hand, if phosphorescence generated from triplet excitons is utilized, an efficiency of at least three times is expected, and even an efficiency of 100 %, i.e., four times, can be expected in principle, if a transition owing to intersystem crossing from a singlet state having a higher energy to a triplet state is taken into account.

[0013] However, like a fluorescent-type device, such an organic luminescence device utilizing phosphorescence is generally required to be further improved regarding the deterioration of luminescence efficiency and device stability.

[0014] The reason of the deterioration has not been fully clarified, but the present inventors consider as follows based

on the mechanism of phosphorescence.

[0015] In the case where the luminescence layer comprises a host material having a carrier-transporting function and a phosphorescent guest material, a process of phosphorescence via triplet excitons may include unit processes as follows:

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- 1. transportation of electrons and holes within a luminescence layer,
- 2. formation of host excitons,
- 3. excitation energy transfer between host molecules,
- 4. excitation energy transfer from the host to the guest,
- 5. formation of guest triplet excitons, and
- 6. transition of the guest triplet excitons to the ground state and phosphorescence.

[0016] Desirable energy transfer in each unit process and luminescence are caused in competition with various energy deactivation processes.

[0017] Needless to say, a luminescence efficiency of an organic luminescence device is increased by increasing the luminescence quantum yield of a luminescence center material.

[0018] Particularly, in a phosphorescent material, this may be attributable to a life of the triplet excitons which is longer by three or more digits than the life of a singlet exciton. More specifically, because it is held in a high-energy excited state for a longer period, it is liable to react with surrounding materials and cause polymer formation among the excitons, thus incurring a higher probability of deactivation process resulting in a material change or life deterioration.

[0019] A luminescence device is desired to exhibit high efficiency luminescence and show a high stability. Particularly, it is strongly desired to provide a luminescence material compound which is less liable to cause energy deactivation in a long life of excited energy state and is also chemically stable, thus providing a longer device life.

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SUMMARY OF THE INVENTION

[0020] Accordingly, principal objects of the present invention are to provide a luminescence material which exhibits a high luminescence efficiency and retains a high luminance for a long period, and also provide a luminescence device and a display apparatus using the same.

[0021] In the present invention, a metal complex is used as a luminescence material, particularly a novel luminescent metal complex compound comprising iridium as a center metal and an aromatic group of formula (5) appearing hereinafter as a part of a ligand or as a substituent of a ligand.

[0022] More specifically, the present invention provides as a luminescence material a metal coordination compound represented by formula (1) below:

$$ML_mL'_n$$
 (1),

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wherein M is a metal atom of Ir, Pt, Rh or Pd; L and L' are mutually different bidentate ligands; m is 1, 2 or 3 and n is 0, 1 or 2 with the proviso that m+n is 2 or 3; a partial structure MLm is represented by formula (2) shown below and a partial structure ML $_n$ is represented by formula (3) or (4) shown below:

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wherein CyN1 and CyN2 are each cyclic group capable of having a substituent, including a nitrogen atom and bonded to the metal atom M via the nitrogen atom; CyC1 and CyC2 are each cyclic group capable of having a substituent, including a carbon atom and bonded to the metal atom M via the carbon atom with the proviso that the cyclic group CyN1 and the cyclic group CyC1 are bonded to each other via a covalent bond and the cyclic group CyN2 and the cyclic group CyC2 are bonded to each other via a covalent bond;

the optional substituent of the cyclic groups is selected from a halogen atom, cyano group, a nitro group, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-O-, -O-CO-, -CH=CH- or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom);

E and G are independently a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 - 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom; and

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at least one of the optional substituent(s) of the cyclic groups, and the cyclic groups CyC1 and CyC2 include an aromatic group capable of having a substituent represented by the following formula (5):

wherein the aromatic group of the formula (5) is bonded to CyN1, CyN2, CyC1 or CyC2 via a single bond when the aromatic group is the optional substituent(s) of the cyclic groups, and the aromatic group of the formula (5) is bonded to CyN1 or CyN2 via a single bond and bonded to the metal atom M via a single bond when the aromatic group is CyC1 or CyC2;

Y denotes C=O, CRR', C=C(CN)₂, O or S wherein R and R' are independently a hydrogen atom, a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 - 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -O-CO-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom); and

the optional substituent of the aromatic group of the formula (5) is selected from a halogen atom, cyano group, a nitro group, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom) with the proviso that an adjacent pair of substituents can be bonded to form a cyclic structure.

[0023] Preferred embodiments of the metal coordination compound of the formula (1) according to the present invention include the following:

A metal coordination compound having a partial structure ML'_n represented by the formula (3) in the formula (1).

A metal coordination compound having a partial structure ML'_n represented by the formula (4) in the formula (1).

A metal coordination compound, wherein n is 0 in the formula (1).

A metal coordination compound, wherein the group Y in the formula (5) is C=O or CRR'.

A metal coordination compound wherein the cyclic groups CyC1 in the formula (1) and CyC2 in the formula (3)

are independently selected from phenyl group, thienyl group, thianaphthyl group, naphthyl group, pyrenyl group, 9-fluorenonyl group, fluorenyl group, dibenzofuryl group, dibenzothienyl group, or carbazolyl group, as an aromatic cyclic group capable of having a substituent with the proviso that the aromatic cyclic group can include one or two CH groups that can be replaced with a nitrogen atom, particularly selected from phenyl group or 2-fluorenyl group. A metal coordination compound, wherein the cyclic groups CyN1 in the formula (2) and CyN2 in the formula (3) are independently selected from pyridyl group, pyridazinyl group, and pyrimidinyl group, particularly pyridyl group, as an aromatic cyclic group capable of having a substituent.

A metal coordination compound, wherein the cyclic groups CyN1, CyN2, CyC1 and CyC2 are independently non-substituted, or have a substituent selected from a halogen atom and a linear or branched alkyl group having 1 to 20 carbon atoms {of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH-, -C≡C-, or a divalent aromatic group capable of having a substituent (that is a halogen atom or a linear or branched alkyl group having 1 to 20 carbon atoms (of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom)), and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom}.

[0024] A metal coordination compound, wherein M in the formula (1) is iridium.

[0025] A metal coordination compound represented by the following formula (6):

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 R_4 3

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wherein X denotes CRR', O or S where R and R' are independently a linear or branched alkyl group of formula: C_nH_{2n+1} -in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom; [0026] R2 denotes a hydrogen atom; a fluorine atom; a linear or branched alkyl group of formula: C_nH_{2n+1} - in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom; a phenyl group capable of having a substituent; a 9,9-dialkylfluorenyl group (of which the alkyl groups are independently a linear or branched alkyl group of formula: C_nH_{2n+1} - in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom); a dibenzofuranyl group capable of having a substituent; and a dibenzothienyl group capable of having a substituent; the optional substituent of phenyl group, 9,9-dialkylfluorenyl group, dibenzofuranyl group and dibenzothienyl group is a fluorine atom or a linear or branched alkyl group of formula: C_nH_{2n+1} - in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom.

[0027] The present invention also provides an electroluminescence device, comprising: a pair of electrodes disposed on a substrate, and a luminescence unit comprising at least one organic compound disposed between the electrodes, wherein the organic compound comprises a metal coordination compound represented by the formula (1) described above.

[0028] In the luminescence device, a voltage is applied between the electrodes to emit light.

[0029] In a preferred embodiment of the electroluminescence device, a voltage is applied between the electrodes to emit phosphorescence.

[0030] The present invention further provides a picture display apparatus, comprising an electroluminescence device

described above and a means for supplying electric signals to the electroluminescence device.

[0031] These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

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Figures 1A, 1B and 1C illustrate embodiments of the luminescence device according to the present invention, respectively.

Figure 2 schematically illustrates a panel structure including an EL device and drive means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0033] Basic structures of organic luminescence (EL) devices formed according to the present invention are illustrated in Figures 1A, 1B and 1C.

[0034] As shown in these figures, an organic luminescence device generally comprises, on a transparent substrate 15, a 50 to 200 nm-thick transparent electrode 14, a plurality of organic film layers and a metal electrode 11 formed so as to cover the organic layers.

[0035] Figure 1A shows an embodiment wherein the organic luminescence device comprises a luminescence layer 12 and a hole-transporting layer 13. The transparent electrode 14 may comprise ITO, etc., having a large work function so as to facilitate hole injection from the transparent electrode 14 to the hole-transporting layer 13. The metal electrode 11 comprises a metal material having a small work function, such as aluminum, magnesium or alloys of these elements, so as to facilitate electron injection into the organic luminescence device.

[0036] The luminescence layer 12 comprises a compound (metal coordination compound) according to the present invention. The hole-transporting layer 13 may comprise, e.g., a triphenyldiamine derivative, as represented by α -NPD mentioned above, and also a material having an electron-donative property as desired.

[0037] A device organized above exhibits a current-rectifying characteristic, and when an electric field is applied between the metal electrode 11 as a cathode and the transparent electrode 14 as an anode, electrons are injected from the metal electrode 11 into the luminescence layer 12, and holes are injected from the transparent electrode 15. The injected holes and electrons are recombined in the luminescence layer 12 to form excitons having high energy potential, which cause luminescence during transition to the ground state. In this instance, the hole-transporting layer 13 functions as an electron-blocking layer to increase the recombination efficiency at the boundary between the luminescence layer layer 12 and the hole-transporting layer 13, thereby providing an enhanced luminescence efficiency.

[0038] Further, in the structure of Figure 1B, an electron-transporting layer 16 is disposed between the metal electrode 11 and the luminescence layer 12 in Figure 1A. As a result, the luminescence function is separated from the functions of electron transportation and hole transportation to provide a structure exhibiting more effective carrier blocking, thus increasing the luminescence efficiency. The electron-transporting layer 16, may comprise, e.g., an oxadiazole derivative.

[0039] Figure 1C shows another desirable form of a four-layer structure, including a hole-transporting layer 13, a luminescence layer 12, an exciton diffusion prevention layer 17 and an electron-transporting layer 16, successively from the side of the transparent electrode 14 as the anode.

[0040] The luminescence materials used in the present invention are most suitably metal coordination compounds represented by the above-mentioned formulae (1) to (5), which are found to cause high-efficiency luminescence, retain high luminance for a long period and show little deterioration by current passage.

[0041] The metal coordination compound of the present invention emits phosphorescence, and its lowest excited state is believed to be an MLCT* (metal-to-ligand charge transfer) excited state or π - π * excited state in a triplet state, and phosphorescence is caused at the time of transition from such a state to the ground state.

[0042] Hereinbelow, methods for measurement of some properties and physical values described herein for characterizing the luminescence material of the present invention will be described.

[0043] (1) Judgment between phosphorescence and fluorescence

[0044] The identification of phosphorescence was effected depending on whether deactivation with oxygen was caused or not. A solution of a sample compound in chloroform after aeration with oxygen or with nitrogen is subjected to photoillumination to cause photo-luminescence. The luminescence is judged to be phosphorescence if almost no luminescence attributable to the compound is observed with respect to the solution aerated with oxygen but photo-luminescence is confirmed with respect to the solution aerated with nitrogen. The phosphorescence of all the compounds of the present invention has been confirmed by this method unless otherwise noted specifically.

[0045] (2) Phosphorescence yield (a relative quantum yield, i.e., a ratio of an objective sample's quantum yield Φ (sample) to a standard sample's quantum yield Φ (st)) is determined according to the following formula:

 $\Phi(\text{sample})/\Phi(\text{st}) =$

[Sem(sample)/labs(sample)]/[Sem(st)/labs(st)],

wherein labs(st) denotes an absorption coefficient at an excitation wavelength of the standard sample; Sem(st), a luminescence spectral areal intensity when excited at the same wavelength; labs(sample), an absorption coefficient at an excitation wavelength of an objective compound; and Sem(sample), a luminescence spectral areal intensity when excited at the same wavelength.

[0046] Phosphorescence yield values described herein are relative values with respect to a phosphorescence yield $\Phi = 1$ of $lr(ppy)_3$ as a standard sample.

[0047] (3) A method of measurement of phosphorescence life is as follows.

[0048] A sample compound is dissolved in chloroform and spin-coated onto a quartz substrate in a thickness of ca. $0.1 \, \mu m$ and is exposed to pulsative nitrogen laser light at an excitation wavelength of 337 nm at room temperature by using a luminescence life meter (made by Hamamatsu Photonics K.K.). After completion of the excitation pulses, the decay characteristic of luminescence intensity is measured.

[0049] When an initial luminescence intensity is denoted by I_0 , a luminescence intensity after t(sec) is expressed according to the following formula with reference to a luminescence life τ (sec):

 $I = I_0 \cdot \exp(-t/\tau)$.

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[0050] The luminescence material (metal coordination compound) of the present invention exhibited high phosphorescence quantum yields of 0.11 to 0.9 and short phosphorescence lives of 0.1 to 40 μ sec. A short phosphorescence life becomes a condition for causing little energy deactivation and exhibiting an enhanced luminescence efficiency. More specifically if the phosphorescence life is long, the number of triplet state molecules maintained for luminescence is increased, and the deactivation process is liable to occur, thus resulting in a lower luminescence efficiency particularly at the time of a high-current density. The material of the present invention has a relatively short phosphorescence life thus exhibiting a high phosphorescence quantum yield, and is therefore suitable as a luminescence material for an EL device.

[0051] As a result of various studies of ours, it has been found that an organic EL device using the metal coordination compound of the formula (1) as a principal luminescence material causes high-efficiency luminescence, retains high luminance for a long period and shows little deterioration by current passage.

[0052] In the formula (1) representing the metal coordination compound of the present invention, n may preferably 0 or 1, more preferably 0. Further, the partial structure ML'n may preferably comprise the aromatic group represented by the above-mentioned formula (5). In the formula (5), Y may preferably comprise C=O or CRR'. When Y is CRR' where R and R' are CH₃, the metal coordination compound of the formula (I) may preferably have no substituent. Particularly, when CyC1 is FL2 (appearing hereinafter) where R and R' are CH₃ and CyN1 is Pi, R1 to R4 (as substituents for Pi and FL2) may preferably be hydrogen atom at the same time.

[0053] In the present invention, by incorporating the aromatic group of the formula (5) into the metal coordination compound of the formula (1), it becomes possible to control an emission wavelength (particularly to provide a long emission wavelength). The presence of the aromatic group of the formula (5) is effective in enhancing a solubility of the metal coordination compound of the present invention in an organic solvent, thus facilitating a purification thereof by recrystallization or column chromatography. As a result, the metal coordination compound of the present invention is suitable as a luminescence material for the organic EL device.

[0054] Further, as shown in Examples appearing hereinafter, it has been substantiated that the metal coordination compound of the present invention exhibited an excellent stability in a continuous current passage test. This may be attributable to incorporation of the aromatic group of the formula (5) into the molecular structure of the metal coordination compound of the formula (1) according to the present invention. More specifically, a change in intermolecular interaction due to the introduction of the aromatic group of the formula (5) allows an intermolecular interaction of the metal coordination compound with, e.g., a host material to suppress formation of exciton associates causing thermal deactivation, thus reducing a quenching process thereby to improve phosphorescence yield and device characteristics.

[0055] The luminescence device according to the present invention may preferably be an electroluminescence device of the type wherein a layer of the metal coordination compound of the formula (1) is disposed between opposing two electrodes and a voltage is applied between the electrodes to cause luminescence, as shown in Figures 1A, 1B and 1C.

[0056] For the application to a display, a drive system using a thin-film transistor (TFT) drive circuit according to an active matrix-scheme may be used. Hereinbelow, an embodiment of using a device of the present invention in combination with an active matrix substrate is briefly described with reference to Figure 2.

[0057] Figure 2 illustrates an embodiment of panel structure comprising an EL device and drive means. The panel is provided with a scanning signal driver, a data signal driver and a current supply source which are connected to gate selection lines, data signal lines and current supply lines, respectively. At each intersection of the gate selection lines and the data signal lines, a display pixel electrode is disposed. The scanning signal drive sequentially selects the gate selection lines G1, G2, G3 ... Gn, and in synchronism herewith, picture signals are supplied from the data signal driver to display a picture (image).

[0058] By driving a display panel including a luminescence layer comprising a luminescence material of the present invention, it becomes possible to provide a display which exhibits a good picture quality and is stable even for a long period display.

[0059] Some synthetic paths for providing a metal coordination compound represented by the above-mentioned formula (1) are illustrated below with reference to an iridium coordination compound (m+n = 3) for example:

$$Ir(CH3COCHCOCH3)3 \xrightarrow{3 \times L} Ir(L)3$$

or

[0060] Other metal coordination compound (M = Pt, Rh and Pd) can also be synthesized in a similar manner.

[0061] Some specific structural examples of metal coordination compounds used in the present invention are shown in Tables 1 to Tables 42 appearing hereinafter, which are however only representative examples and are not exhaustive. Pi to Cz for CyN1, CyN2, CyC1 and CyC2 shown in Tables 1 to 42 represent partial structures shown below.

Ph1:
$$R_3$$
 Tn1: R_3 Tn2: R_4 Tn3: R_4 Tn3: R_4 Tn3: R_4

Tn4:
$$R_3$$
 R_4 R_4 R_5 R_5

5 Cn1:
$$R_{1}$$
 Cn2: R_{2} R_{3} R_{4} R_{5} R_{4} R_{5} R_{5}

25 [0062] Further, aromatic group Ph2 to DBT3 as substituents for CyN1, CyN2, CyC1 and CyC2 shown in Tables 1 to 42 represent partial structures shown below, with the proviso that substituents R5 to R8 of the aromatic groups represent hydrogen atoms when they are not specifically indicated.

Ph2:
$$R_6$$
 Tn5: R_6 Tn6: R_6 Np3: R_6 Np3: R_6 Np4: R_6 Tn7: R_6 Tn8: R_6 Tn8: R_6 Np4: R_6 Np4: R_6 Np4: R_6 Np4: R_6 Np5: R_6 Np6: R_6 Np6: R_6 Np7: R_6 Np7: R_6 Np6: R_6 Np7: R_6

An: Pe2:
$$R_5$$
 Pi2: R_5 Pi3: R_5

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DBF3:
$$R_5$$
 DBT2: R_5 DBT3: R_6 DBT3: R_7

20 Table 1

No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N 1	
										R5	R6	R7	R8
						R"	R'"	CyC1-R3	CyC1-R4		СуС	C1	
										R5	R6	R7	R8
1	lr	3	0	Pi	FL1	-	-	Н	Н	-	-	-	-
						-	-	Н	Н	-	-	-	-
2	lr	3	0	Pi	FL1	-	ı	Н	CF ₃	-	-	-	-
						-	ı	Н	Н	-	-	-	-
3	lr	3	0	Pi	FL1	-	ı	CF ₃	CF ₃	-	-	-	-
						-	-	Н	Н	-	-	-	-
4	lr	3	0	Pi	FL1	-	ı	Н	CH ₃	-	Н	-	-
						-	ı	Н	Н	-	-	-	-
5	lr	3	0	Pi	FL1	-	-	Н	Н	-	-	-	-
						-	-	Н	OC ₄ H ₉	-	-	-	-
6	lr	3	0	Pi	FL1	-	ı	Н	FL4	Н	Н	Н	-
						-	-	Н	Н	-	-	-	-
7	lr	3	0	Pi	FL1	-	-	Н	FL5	Н	Н	Н	-
						CH ₃	CH ₃	Н	Н	-	-	-	-
8	lr	3	0	Pi	FL1	-	-	Н	FL6	Н	Н	Н	-
						-	-	Н	Н	-	-	-	-
9	lr	3	0	Pi	FL1	-	-	Н	DBF2	Н	Н	Н	-
						-	-	Н	Н	-	-	-	-
10	lr	3	0	Pi	FL1	-	-	Н	DBT3	Н	Н	Н	-
						-	-	Н	Н	-	-	-	-
11	lr	3	0	Pi	FL1	-	-	Н	Ph2	Н	Н	Н	Н
						-	-	Н	Н	-	-	-	-

Table 1 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		CyN	N 1	
											R5	R6	R7	R8
5							R"	R'"	CyC1-R3	CyC1-R4		CyC	21	
											R5	R6	R7	R8
	12	lr	3	0	Pi	FL1	-	-	Н	Ph2	Н	C_3H_7	Н	Н
10							-	-	Н	Н	-	-	-	-
	13	lr	3	0	Pi	FL1	-	-	Н	FL4	Н	Ph3	Н	-
							-	-	Н	Ph2	Н	Н	Н	Н
	14	lr	3	0	Pi	FL1	-	-	Н	Np4	Н	-	-	-
15							-	-	Н	Н	-	-	-	-
	15	lr	3	0	Pi	FL1	-	-	Н	Tn7	Н	Н	-	-
							-	-	Н	Н	-	-	-	-
20	16	lr	3	0	Pi	Ph1	-	-	Н	FL4	Н	Н	Н	-
							-	-	Н	Н	-	-	-	-

Table 2

							Table 2						
No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
										R5	R6	R7	R8
						R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
										R5	R6	R7	R8
17	lr	3	0	Pi	Np2	-	-	Н	FL4	Н	Н	Н	-
						-	-	Н	Н	-	-	-	-
18	Ir	3	0	Pi	FL1	-	-	Н	Ph2	Н	FL4	Н	Н
						-	-	Н	Н	-	-	-	-
19	lr	3	0	Pi	Ph1	-	-	Н	Н	-	-	-	-
						-	-	FL4	Н	Н	Н	Н	-
20	lr	3	0	Pi	Ph1	-	-	Н	Н	-	-	-	-
						C ₂ H ₅	C ₂ H ₅	FL5	Н	Н	Н	Н	-
21	Ir	3	0	Pi	Ph1	-	-	Н	Ph2	Н	FL4	Н	Н
						-	-	Н	Н	-	-	-	-
22	Ir	3	0	Pi	Np2	-	-	Н	Ph2	Н	FL4	Н	Н
						-	-	Н	Н	-	-	-	-
23	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
						-	-	Н	Н	-	-	-	-
24	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	CF ₃	-	-	-	-
						-	-	Н	Н	ı	-	-	-
25	lr	3	0	Pi	FL2	CH ₃	CH ₃	CF ₃	CF ₃	-	-	-	-
						-	-	Н	Н	-	-	-	-

Table 2 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
											R5	R6	R7	R8
5							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
	26	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	CH ₃	-	-	-	-
10							ı	ı	Н	H	-	ı	-	-
	27	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Н	-	ı	-	-
							ı	ı	Н	OC ₄ H ₉	-	-	-	-
45	28	lr	3	0	Pi	FL2	C_2H_5	C_2H_5	Н	H	-	1	-	-
15							1	1	Н	Н	-	-	-	-
	29	lr	3	0	Pi	FL2	C_3H_7	C ₃ H ₇	Н	Н	-	-	-	-
							1	1	Н	Н	-	-	-	-
20	30	lr	3	0	Pi	FL2	C_4H_9	C ₄ H ₉	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
	31	lr	3	0	Pi	FL2	C ₅ H ₁₁	C ₅ H ₁₁	Н	Н	-	-	-	-
25							-	-	Н	Н	-	-	-	-
20	32	lr	3	0	Pi	FL2	C ₆ H ₁₃	C ₆ H ₁₃	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-

Table 3

	R8		88	ı		ı	ı	ı	ı	ı	ı					ı	ı	ı	ı	ı	ı		ı		ı
5	R7	5	R7																	I		I		I	
CyN1	R6	CyC1	R6		1		,			,								,		I		I	,	I	
	R5		R5		1		ı			ı							ı	ı	ı	I		I	ı	I	
CyN1-R2		CyC1-R4		I	I	I	I	CF ₃	I	I	OC ₄ H ₉	I	I	I	I	I	I	I	I	FL4	I	FL5	I	FL5	I
CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
ŭ		R."		C ₇ H ₁₅	ı	C ₈ H ₁₇	ı	C ₁₀ H ₂₁	ı	C ₁₅ H ₃₁	ı	C ₂₀ H ₄₁		Ph3	ı	Ph3	ı	(CH ₂) ₅ Ph3	ı	CH ₃	ı	I	CH ₃	CH ₃	CH ₃
~		Α"		C ₇ H ₁₅	1	C ₈ H ₁₇		C ₁₀ H ₂₁	ı	C ₁₅ H ₃₁	1	C ₂₀ H ₄₁		Ph3	1	CH ₃	ı	(CH ₂) ₅ Ph3	1	CH ₃		I	CH3	CH ₃	CH3
CyC1				FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2	
CyN1				ā		ā		Ē		Ē		Ē		Ē		Ē		Ē		ā		Ē		Ē	
С				0		0		0		0		0		0		0		0		0		0		0	
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Σ				۲		۲		۲		۲		느		느		۲		۲		۲		٢		۲	
_o N				33		34		35		36		37		38		39		40		41		42		43	

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R8

R7

CyC1

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	Cyl	R6	Š	R6	I	ı	I	-	I	-	I	1	I	ı
		R5		R5	I		I	-	I	-	I	ı	Н	
	CyN1-R2		CyC1-R4		FL5	I	FL5	I	FL5	I	FL5	I	FL5	I
	CyN1-R1		CyC1-R3		н	I	т	н	Н	Н	I	Н	Н	I
Table 3 (continued)	Ā		Х		C ₂ H ₅	C_2H_5	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C_8H_{17}	C ₁₅ H ₃₁	C ₁₅ H ₃₁	Ph3	Ph3
Table 3	α.		<u>"</u>		C ₂ H ₅	C ₂ H ₅	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C ₈ H ₁₇	C ₁₅ H ₃₁	C ₁₅ H ₃₁	Ph3	Ph3
	CyC1				FL2		FL2		FL2		FL2		FL2	
	CyN1				Ε		Ы		Ε		Pi		Pi	
	u				0		0		0		0		0	
	ш				3		3		3		3		ε	
	Σ				ᅩ		_		ᅩ		Ir		ıl	
	9 N				44		45		46		47		48	

	R8		R8	'	'	ı	ı	'	'	ı	-	'	1	I	'	I	ı	I	'	I	'	'	'	1	'
	R7		R7	I		I	ı	I		I	-	I		I		I	-	I		I				1	
CyN1	R6	Cyc1	R6	I	ı	ェ	ı	I	1	I	1	I	ı	I	1	I	ı	OCH ₂ C ₅ F ₁₁	ı	OC≡C-C ₇ H ₁₅	1	I	ı	ェ	
	R5		R5	I		I	ı	I	,	I	-	I		I	ı	CF ₃	ı	I		I	ı	т	ı	I	
CyN1-R2	•	CyC1-R4		FL5	I	FL5	I	FL6	I	DBF2	Н	DBT3	I	Ph2	I	Ph2	т	Ph2	I	Ph2	I	Tn5	I	Tn6	I
CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	Н	I	I	ェ	I	I	н	I	I	I	I	I	I	I	I
\frac{\alpha}{2}		 Z		Ph3	Ph3	(CH ₂) ₅ Ph3	CH ₃	CH ₃		C ₂ H ₅	-	CH ₃	1	CH ₃	1	CH ₃	ı	CH ₃		CH ₃		C ₃ H ₇	ı	CH ₃	
œ		Ţ.		CH3	CH ₃	(CH ₂) ₅ Ph3	CH ₃	CH ₃		C ₂ H ₅	•	CH ₃	1	CH ₃		CH ₃	ı	CH ₃		CH ₃		C ₃ H ₇	ı	CH ₃	1
CyC1				FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2	
CyN1				iΞ		iΞ		iΞ		ï		iΞ		iΞ		ï		Ē		iΞ		iΞ		Ē	
С				0		0		0		0		0		0		0		0		0		0		0	
٤				3		3		3		က		3		3		က		3		3		3		8	
Σ				느		느		느		<u>-</u>		<u>-</u>		느		<u>-</u>		느		느		<u>-</u>		_	
N _o				49		20		51		52		53		54		22		99		22		28		29	

Table 4 (continued)

		R8		R8			1		ı			ı	1	
		R7		R7	1	ı		-	ı	-	-	ı	1	-
	CyN1	R6	Cyc1	R6	Н	1	ı	ı	Н	1	Н	ı	ı	-
		R5		R5	I	ı	I	-	I	-	н	ı	I	-
	CyN1-R2		CyC1-R4		Np3	I	Np4	Н	Tn7	Н	Tn8	I	An	I
nen)	CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	I	I
able 4 (collillined)	Ľ.		<u>"</u>		CH ₃	ı	CH ₃	ı	CH ₃	1	CH ₃	ı	CH ₃	
<u></u>	œ		<u>"</u>		CH ₃	ı	CH ₃	-	CH ₃	-	СН3	ı	CH ₃	
	CyC1				FL2		FL2		FL2		FL2		FL2	
	CyN1				ā		Ē		ā		Ρi		Ē	
	C				0		0		0		0		0	
	٤				3		3		ဗ		3		3	
	Σ				느		느		느		Ir		느	
	8				09		61		62		63		64	

	R8		R8												ı	1	I	ı	I	ı	I		I	1	I
_	R7	_	R7			ı	ı			ı		ı			ı	I	I	I	I	I	I	I	I	I	I
CyN1	R6	cyc	R6			I		I		I		ı			ı	Ph3	I	Ph3	I	Ph3	I	Ph3	I	Ph3	I
	R5		R5	I		I	,	I		I		I		I		Н	エ	I	I	I	I	I	I	I	т
CyN1-R2	1	CyC1-R4		Pe2	I	Pi2	I	Pi3	I	Qn2	I	Np4	I	An	I	FL4	Ph2	FL5	Ph2	FL5	Ph2	FL5	Ph2	FL5	Ph2
CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	I	I	I	I	Ŧ	I	I	I	I	I	I	I	I	I
اهارة ج آج		<u>.</u>		CH3		CH ₃	ı	CH ₃		CH ₃		Ph3		Ph3	ı	CH ₃	ı	CH ₃	CH ₃	Ph3	Ph3	Ph3	Ph3	Ph3	Ph3
ď		ŗ.		CH ₃		CH ₃	ı	CH ₃		CH ₃		Ph3		CH ₃	ı	CH ₃	ı	CH ₃	CH ₃	Ph3	Ph3	CH ₃	CH ₃	CH ₃	CH ₃
CyC1				FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2	
CyN1				Ē		Ē		Ē		Ē		Ξ		Ē		Ē		Ē		Ξ		Ξ		Ē	
۵				0		0		0		0		0		0		0		0		0		0		0	
Ε				က		3		က		က		3		8		က		3		က		3		8	
Σ				느		느		느		느		느		_		<u>-</u>		느		느		느		느	
٥ N				65		99		29		89		69		20		7.1		72		73		74		22	

ole 5 (continued)

		R8		82	'	ェ	'	'	٠	1	'	٠	'	'
	_	R7	_	R7	I	I	I		I	1	I	,	I	
	CyN1	R6	CyC1	R6	Ph3	I	Ph3	I	Ph3	I	Ph3	I	Ph3	
		R5		R5	I	I	I	C ₃ H ₇	I	I	I	I	I	I
	CyN1-R2		CyC1-R4		FL5	Ph2	FL5	Tn5	FL5	Tn6	FL5	Np3	FL5	Np4
,	CyN1-R1		CyC1-R3		I	I	Н	н	I	н	H	I	н	I
lable 5 (confinited)	ùΥ		<u>"</u> "		(CH ₂) ₃ Ph3	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃
lable	2		<u>"</u>		(CH ₂) ₃ Ph3	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃	CH ₃
	CyC1				FL2		FL2		FL2		FL2		FL2	
	CyN1				Pi		<u>F</u>		Pi		Pi		Pi	
	u				0		0		0		0		0	
	٤				3		က		က		3		က	
	Σ				ı		느		느		Ir		ı	
	_S				92		77		78		62		80	

Table 6

10															
		No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		CyN	1	
10	5											R5	R6	R7	R8
10								R"	R'''	CyC1-R3	CyC1-R4		СуС	1	
10												R5	R6	R7	R8
Record R		81	lr	3	0	Pi	FL2	CH ₃	Ph3	Н	FL5	Н	Ph3	Н	-
15	10							CH ₃	Ph3	Н	Tn7	Н	Н	-	-
15		82	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Н	-
Second Process Seco								CH ₃	CH ₃	Н	Tn8	Η	Н	•	-
84	15	83	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Η	Ph3	Н	-
20								CH ₃	CH ₃	Н	An	Н	-	-	-
S		84	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Н	-
SS	00							CH ₃	CH ₃	Н	Pe2	Н	-	-	-
86	20	85	lr	3	0	Pi	FL2	CH ₃	Ph3	Н	FL5	Н	Ph3	Н	-
25								CH ₃	Ph3	Н	Pi2	C_2H_5	Н	-	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		86	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Н	-
30 88 Ir 3 0 Pi FL2 CH3 CH3 H DBT3 H H - 89 Ir 3 0 Pi Ph1 - - H FL5 H H H 90 Ir 3 0 Pi Ph1 - - H FL5 H H H 91 Ir 3 0 Pi Ph1 - - H FL5 H H H 92 Ir 3 0 Pi Ph1 - - H FL5 H H H 93 Ir 3 0 Pi Ph1 - - H FL5 H H H 94 Ir 3 0 Pi Tn2 - H FL5 H H H 95 Ir 3 0 Pi Tn2 - H FL5 H H H 96 Ir 3 0 Pi Tn3 - - H FL5 H H H 94 Ir 3 0 Pi Tn3 - - H FL5 H H H 95 Ir 3 0 Pi Tn3 - - H FL5 H H H 96 Ir 3 0 Pi Tn3 - - H FL5 H H H 96 Ir 3 0 Pi Tn3 - - H FL5 H H H 97 Tn3 - - H FL5 H H H 98 Tr 3 0 Pi Tn3 - - H FL5 H H H 99 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H FL5 H H H 90 Tn3 Tn3 - - H Tn3 - Tn3 H 90 Tn3 Tn3 - Tn3 - Tn3 - Tn3 - Tn3 - Tn3	25							CH ₃	CH ₃	Н	Pi3	Н	Н	-	-
88		87	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Н	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								CH ₃	CH ₃	Н	Qn2	Н	Н	-	-
89	30	88	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Н	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	30							CH ₃	CH ₃	Н	DBT3	Н	Н	-	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		89	lr	3	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Н	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								CH ₃	CH ₃	Н	Н	-	-	-	-
91 Ir 3 0 Pi Ph1 - - H FL5 H H H 92 Ir 3 0 Pi Ph1 - - H FL5 H H H 93 Ir 3 0 Pi Ph1 - - H FL5 H H H 94 Ir 3 0 Pi Tn1 - - H FL5 H H H 95 Ir 3 0 Pi Tn2 - H FL5 H H H 96 Ir 3 0 Pi Tn3 - - H FL5 H H H 97 Tn3 - - H FL5 H H H 98 Ir 3 0 Pi Tn3 - - H FL5 H H H 99 Ir 3 0 Pi Tn3 - - H FL5 H H H 90 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 H H H H 92 Ir H H H H 93 Ir H H H 94 Ir H H H 95 Ir H H H 96 Ir H H H H 97 Ir H H H 98 Ir H H H 99 Ir H H H H 90 Ir H H H H H 91 Ir H H H 91 Ir H H H 92 Ir H H H H 93 Ir H H H H 94 Ir H H H 95 Ir H H H 96 Ir H H H H 97 Ir H H H 98 Ir H H H 99 Ir H H H 90 Ir H H H 91 H H H 91 H H H 91 H H H 92 Ir H H H 93 H H H H 94 H H H H 95 Ir H H H 96 Ir H H H 97 Ir H H 98 Ir H H H 99 Ir H H 90 Ir H H 91	35	90	lr	3	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Н	-
40 92 Ir 3 0 Pi Ph1 - - H FL5 H H H 93 Ir 3 0 Pi Ph1 - - H FL5 H H H 94 Ir 3 0 Pi Th1 - - H FL5 H H H 60 Pi Th2 - H FL5 H H H 60 Pi Th2 - H FL5 H H H 60 Pi Th2 - H FL5 H H H 60 Pi Th2 - H FL5 H H H 60 Pi Th2 - H FL5 H H H 60 Pi Th2 - H FL5 H H H 70 Pi Th2 - H FL5 H H H 70 Pi Th2 - H FL5 H H H 71 Ph3 Ph3 H H - - - 80 Pi Th2 - H FL5 H H H 80 Pi Th3 - H FL5 H H 80 Pi Th3 - H FL5 H H 80 Pi Th3 - H FL5 H 80 Pi Th3 - H FL5 H 80 Pi Th3 - H 80 Pi Th3 - H 80 Pi Th3 H 80 Pi Th3 - H 80 Pi Th3 80 Pi								C ₅ H ₁₁	C ₅ H ₁₁	Н	Н	-	-	-	-
92 Ir 3 0 Pi Ph1 - - H FL5 H H H 93 Ir 3 0 Pi Ph1 - - H FL5 H H H 45 94 Ir 3 0 Pi Tn1 - - H FL5 H H H 50 95 Ir 3 0 Pi Tn2 - H FL5 H H H 96 Ir 3 0 Pi Tn3 - - H FL5 H H H 97 Tn3 - - H FL5 H H H 98 Ir 3 0 Pi Tn3 - - H FL5 H H H 99 Ir 3 0 Pi Tn3 - - H FL5 H H H 90 Ir 3 0 Pi Tn3 - - H FL5 H H H 90 Ir 3 0 Pi Tn3 - - H FL5 H H H 90 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H 91 Ir 3 0 Pi Tn3 - - H FL5 H H H		91	lr	3	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Н	-
92 Ir 3 0 Pi Ph1 - - H FL5 H H H 93 Ir 3 0 Pi Ph1 - - H FL5 H H H 94 Ir 3 0 Pi Tn1 - - H FL5 H H H 95 Ir 3 0 Pi Tn2 - H FL5 H H H 60 FL5 H H H 70 FL5 FL5 H H 70 FL5 FL5 H H H 70 FL5 H H H 70 FL5 FL5 H H 70 FL5 FL5 H H H 70 FL5 FL5 H H 70 FL5 FL5 H H H 70 FL5 FL5 H H H	40							CH ₃	CH ₃	Н	CF3	-	-	-	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		92	lr	3	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Н	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								Ph3	Ph3	Н	Н	-	-	-	-
94 Ir 3 0 Pi Tn1 - - H FL5 H H H 50 95 Ir 3 0 Pi Tn2 - - H FL5 H H H CH ₃ CH ₃ H H - - - CH ₃ CH ₃ H H - - - 96 Ir 3 0 Pi Tn3 - - H FL5 H H H The state of the st		93	lr	3	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Н	-
95 Ir 3 0 Pi Tn2 - H FL5 H H H 96 Ir 3 0 Pi Tn3 H FL5 H H H H	45							CH ₃	Ph3	Н	Н	-	-	-	-
95 Ir 3 0 Pi Tn2 - - H FL5 H H H H H H H H H		94	lr	3	0	Pi	Tn1	-	-	Н	FL5	Н	Н	Н	-
96 Ir 3 0 Pi Tn3 H FL5 H H H								CH ₃	CH ₃	Н	Н	-	-	-	-
96 Ir 3 0 Pi Tn3 H FL5 H H H	50	95	lr	3	0	Pi	Tn2	-	-	Н	FL5	Н	Н	Н	-
								CH ₃	CH ₃	Н	Н	-	-	-	-
		96	lr	3	0	Pi	Tn3	-	-	Н	FL5	Н	Н	Н	-
								CH ₃	CH ₃	Н	Н	-	-	-	-

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Table 7

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N1	
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
	97	lr	3	0	Pi	Tn4	-	-	Н	FL5	Н	Н	Н	-
0							CH ₃	CH ₃	Н	Н	-	-	-	-
	98	lr	3	0	Pi	Np1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
5	99	lr	3	0	Pi	Np2	-	-	Н	FL5	Н	Н	Н	•
							CH ₃	CH ₃	Н	Н	-	-	-	-
	100	lr	3	0	Pi	Pe1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
)	101	lr	3	0	Pi	Np2	-	-	Н	FL5	Н	Н	Н	-
							Ph3	Ph3	Н	Н	-	-	-	-
	102	lr	3	0	Pi	Pe2	-	-	Н	FL5	Н	Н	Н	-
5							CH ₃	CH ₃	Н	Н	-	-	-	-
	103	lr	3	0	Pi	Cn1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	-	-	-	-	-
	104	Ir	3	0	Pi	Cn2	-	-	Н	FL5	Н	Н	Н	-
)							CH ₃	CH ₃	Н	-	-	-	-	-
	105	Ir	3	0	Pi	FL3	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
5	106	lr	3	0	Pi	DBF1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	107	lr	3	0	Pi	DBT1	-	-	Н	FL5	Н	Н	Н	-
^							CH ₃	CH ₃	Н	Н	-	-	-	-
)	108	lr	3	0	Pi	Qn1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	109	lr	3	0	Pi	Qn2	-	-	Н	FL5	Н	Н	Н	-
5							CH ₃	CH ₃	Н	Н	-	-	-	-
	110	lr	3	0	Pi	Cz	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Ph3	Н	-	-	-	-
n	111	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Ph2	Н	FL5	Н	Н
0							CH ₃	CH ₃	Н	Н	-	-	-	-
	112	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Tn5	FL5	Н	-	-
							CH ₃	CH ₃	Н	Н	-	-	-	-

Table 8

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
	113	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Tn6	FL5	Н	-	-
10							CH ₃	CH ₃	Н	Н	-	-	-	-
	114	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Np3	FL5	Н	-	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
15	115	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Np4	FL5	-	-	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	116	lr	3	0	Pi	FL2	Ph3	Ph3	Н	Tn7	FL5	Н	-	-
							Ph3	Ph3	Н	Н	-	-	-	-
20	117	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Tn8	FL5	Н	-	-
							Ph3	Ph3	Н	Н	-	-	-	-
	118	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	An	FL5	-	-	-
25							CH ₃	CH ₃	Н	Н	-	-	-	-
	119	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Pe2	FL5	-	-	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
20	120	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Qn2	FL5	Н	-	-
30							CH ₃	CH ₃	Н	Н	-	-	-	-
	121	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL4	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
35	122	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	123	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL6	FL5	Н	Н	-
40							CH ₃	CH ₃	Н	Н	-	-	-	-
40	124	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	DBF2	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	125	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	DBF3	FL5	Н	Н	-
45							CH ₃	CH ₃	Н	Н	-	-	-	-
	126	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	DBT2	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
50	127	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	DBT3	FL5	Н	Н	-
00							CH ₃	CH ₃	Н	Н	-	-	-	-
	128	lr	3	0	Pi	Ph1	-	-	Н	Н	-	-	-	-
							C ₈ H ₁₇	C ₈ H ₁₇	FL5	Н	Н	Н	Н	-

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Table 9

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
	129	lr	3	0	Pi	Tn1	-	-	Н	Н	-	-	-	-
10							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	130	lr	3	0	Pi	Tn2	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
15	131	lr	3	0	Pi	Tn3	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	132	lr	3	0	Pi	Tn4	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
20	133	lr	3	0	Pi	Np2	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	134	lr	3	0	Pi	Pe1	-	-	Н	Н	-	-	-	-
25							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	135	lr	3	0	Pi	Cn1	-	-	Н	Н	-	-	ı	-
							CH ₃	CH ₃	FL5	-	Н	Н	Н	-
00	136	lr	3	0	Pi	Cn2	-	-	Н	Н	-	-	-	-
30							CH ₃	CH ₃	FL5	-	Н	Н	Н	-
	137	lr	3	0	Pi	FL3	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
35	138	lr	3	0	Pi	DBF1	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	139	lr	3	0	Pi	DBT1	-	-	Н	Н	-	-	-	-
40							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
40	140	lr	3	0	Pi	Qn1	-	-	Н	Н	-	-	-	-
							CH ₃	Ph3	FL5	Н	Н	Н	Н	-
	141	lr	3	0	Pi	Qn2	-	-	Н	Н	-	-	-	-
45							C ₅ H ₁₁	C ₅ H ₁₁	FL5	Н	Н	Н	Н	-
	142	lr	3	0	Pi	Cz	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
50	143	lr	3	0	Pi	Ph1	-	-	Н	Ph2	Н	FL5	Н	Н
50							CH ₃	CH ₃	Н	Н	-	-	-	-
	144	lr	3	0	Pi	FL3	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
55		'												

Table 10

								iubio i						
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
5											R5	R6	R7	R8
							R"	R'"	CyC1-R3	CyC1-R4		Су	с1	
											R5	R6	R7	R8
	145	lr	3	0	Pi	FL3	-	-	Н	CF ₃	-	-	-	-
10							-	-	Н	Н	-	-	-	-
	146	lr	3	0	Pi	DBF1	CH ₃	CH ₃	CF ₃	CF ₃	-	-	-	-
							-	-	Н	Н	1	-	-	-
15	147	lr	3	0	Pi	DBT1	CH ₃	CH ₃	Н	CH ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-
	148	lr	3	0	Pi	FL3	-	-	Н	FL6	Н	Н	Н	-
							-	-	Н	Н	-	-	-	-
20	149	lr	3	0	Pi	DBF1	-	-	Н	DBF2	Н	Н	Н	-
							-	-	Н	Н	-	-	-	-
	150	lr	3	0	Pi	DBT1	-	-	Н	DBT3	Н	Н	Н	-
25							-	-	Н	Н	-	-	-	-
	151	Rh	3	0	Pi	FL1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
30	152	Rh	3	0	Pi	FL1	-	-	Н	CF ₃	-	-	-	-
30							-	-	Н	Н	ı	-	ı	-
	153	Rh	3	0	Pi	FL1	-	-	Н	FL4	Η	Н	Η	-
							-	-	Н	Н	ı	-	1	-
35	154	Rh	3	0	Pi	FL1	-	-	Н	FL5	Η	Н	Η	-
							CH ₃	CH ₃	Н	Н	ı	-	ı	-
	155	Rh	3	0	Pi	FL1	-	-	Н	Ph2	Ι	Н	Ι	Н
40							ı	ı	Н	Н	ı	-	i	-
40	156	Rh	3	0	Pi	FL1	-	-	Н	FL4	Ι	Ph3	Ι	-
							-	-	Н	Ph2	Ι	Н	Ι	Н
	157	Rh	3	0	Pi	FL1	-	-	Н	Np4	Ι	-	ı	-
45							-	-	Н	Н	ı	-	ı	-
	158	Rh	3	0	Pi	Ph1	-	-	Н	FL4	Ι	Н	Н	-
							-	-	Н	Н	ı	-	ı	-
50	159	Rh	3	0	Pi	Np2	-	-	Н	FL4	Н	Н	Н	-
							-	-	Н	Н	ı	-	ı	-
	160	Rh	3	0	Pi	FL1	-	-	Н	Ph2	Н	FL4	Н	Н
							-	-	Н	Н	ı	-	-	-

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9 N	Σ	٤	_	CyN1	CyC1	œ	<u>~</u>	CyN1-R1	CyN1-R2		CyN1	Z	
										R5	R6	R7	R8
						<u>"</u>	<u></u>	CyC1-R3	CyC1-R4		CyC1	2	
										R5	R6	R7	R8
161	돈	3	0	<u>i</u>	Ph1		1	I	I		-		
					•			FL4	I	I	I	ェ	ı
162	돤	3	0	Pi	Ph1		ı	I	Ph2	I	FL4	I	I
						ı	ı	I	т	-	-	ı	ı
163	돈	3	0	<u>i</u>	FL2	CH ₃	CH ₃	I	I			ı	ı
						ı	-	H	н	-	-	-	ı
164	돈	3	0	<u>a</u>	FL2	CH ₃	CH ₃	I	CF ₃	-	-	ı	
							ı	I	н	ı		1	ı
165	돈	3	0	<u>i</u>	FL2	CH ₃	CH ₃	CF ₃	CF ₃		-	ı	ı
					1		ı	I	I				
166	돤	3	0	Pi	FL2	C ₂ H ₅	C ₂ H ₅	I	н	ı	ı	ı	ı
						ı	ı	I	I	ı	ı	ı	ı
167	돈	3	0	<u>F</u>	FL2	C ₃ H ₇	C ₃ H ₇	I	т	1	1	ı	ı
						,		I	I	ı	ı	ı	ı
168	格	3	0	Pi	FL2	C ₄ H ₉	C ₄ H ₉	I	т	ı	ı	ı	ı
							ı	I	н	ı		1	ı
169	格	3	0	Pi	FL2	C ₅ H ₁₁	C_5H_{11}	I	Н	-	-		ı
						1	-	I	I	-	-		ı
170	돲	3	0	Pi	FL2	C ₆ H ₁₃	C ₆ H ₁₃	Н	Н	-	-	ı	1
							-	I	Н	-	-		ı
171	Rh	3	0	ŀ	FL2	C ₁₅ H ₃₁	$C_{15}H_{31}$	I	Н	-	-		ı
						ı	-	I	OC_4H_9	-	-	ı	ı

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	Ξ	Ľ.	CyC1	Ĭ.	'	'	'	'	'	'	_	'	Т	
	CyN1	R6	Š	R6	1	ı	,		ı	-	I		т	
		R5		R5	1		1	-	ı	-	I	1	Н	ı
	CyN1-R2		CyC1-R4		I	I	I	I	Т	I	FL5	I	FL5	I
	CyN1-R1		CyC1-R3		I	I	I	I	Н	I	I	I	Н	I
Table 11 (continued)	Ľ		<u>۳</u>		Ph3	1	Ph3	1	(CH ₂) ₅ Ph3	1	I	CH ₃	CH ₃	CH ₃
Table 1	~		<u>"</u>		Ph3	ı	CH ₃	1	(CH ₂) ₅ Ph3		I	CH ₃	CH ₃	CH ₃
	CyC1				FL2		FL2		FL2		FL2		FL2	
	CyN1				Ρi		Ρi		Ē		Pi		Pi	
	u				0		0		0		0		0	
	ш				3		3		3		3		3	
	Σ				R		R		R		Rh		Rh	
	No				172		173		174		175		176	

		R8		R8	'	'	ı	ı	1	ı	1	1	ı	•	ı	ı	'	ı	1	1	I	•	I	ı	'	ı
	CyN1	R7	CyC1	R7	I	1	Н	-	Н	-	I	-	I		Н	-	I	-	I	-	I		I	ı	1	1
	Cy	R6	Š	R6	I		Н	-	Н	-	I	-	н		Н	-	I	-	I	-	I		I	-	I	-
		R5		R5	I		Н	1	I	ı	I	-	I		Н	ı	I	ı	I	-	I		CF ₃	ı	I	
	CyN1-R2		CyC1-R4		FL5	I	FL5	I	FL5	н	FL5	Н	FL5	I	FL5	I	FL5	т	FL6	Н	Ph2	I	Ph2	I	Tn5	Н
	CyN1-R1		CyC1-R3		I	I	Н	I	I	I	I	I	I	I	Н	I	I	I	I	I	I	I	I	I	I	н
Table 12	Ά.		π		C ₂ H ₅	C ₂ H ₅	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C ₈ H ₁₇	C ₁₅ H ₃₁	C ₁₅ H ₃₁	Ph3	Ph3	Ph3	Ph3	(CH ₂) ₅ Ph3	CH ₃	CH ₃		CH3	1	CH ₃	ı	C ₃ H ₇	1
T	Δ.		<u>"</u>		C ₂ H ₅	C ₂ H ₅	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C ₈ H ₁₇	C ₁₅ H ₃₁	C ₁₅ H ₃₁	Ph3	Ph3	CH ₃	CH ₃	(CH ₂) ₅ Ph3	CH ₃	CH ₃	-	CH ₃		CH ₃		C ₃ H ₇	1
	CyC1				FL2		FL2		FL2		FL2		FL2	•	FL2		FL2		FL2		FL2	•	FL2		FL2	
	CyN1				ä		Ы		Pi		ā		Ē		Ы		ä		ā		ä		ä		Ē	
	u				0		0		0		0		0		0		0		0		0		0		0	
٠	٤				က		3		3		က		3		3		က		က		3		3		က	
	Σ				格		Rh		Rh		R		Rh		Rh		格		R		뫈		R		R	
	9				77		82		62		80		81		82		83		84		85		98		87	

10

R8

R7

R8

 R_7

15

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CyN1 CyC1 R6 **R**6 I I R5 R5 I I I I I CyN1-R2 CyC1-R4 Np3Tn8 Np4 An Pe2 I I I I I CyN1-R1 CyC1-R3 I I I I I I I I I I Table 12 (continued) CH₃ CH_3 CH_3 $_{\rm CH_3}$ <u>.</u> ď CH₃ CH_3 CH_3 α 'n CyC1 FL2 FL2 FL2 CyN1 Ē Ē 回 Ē Ē ⊏ 0 0 0 Ε က က R Σ 뫈 문 牊 牊 188 189 190 191 192 g

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	1	R7	_	R7	I	I	I	I	I	I	I	I	I	I	I	ı	I		I		I		I	ı	I	1
(CyN1	R6	CyC1	R6	Ph3	I	Ph3	I	Ph3	I	Ph3	I	Ph3	I	Ph3	I	I	ı	I		I	ı	I	ı	I	1
		R5		R5	I	I	т	I	т	т	I	т	I	I	Н	C ₃ H ₇	I	ı	I		ェ	ı	I	ı	I	1
	CyN1-R2		CyC1-R4		FL4	Ph2	FL5	Ph2	FL5	Ph2	FL5	Ph2	FL5	Ph2	FL5	Tn5	FL5	I	FL5	I	FL5	CF3	FL5	I	FL5	Н
	CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	I	I	Н	I	I	I	I	I	I	I	Н	I	I	I
2 1	ř		R'''		CH ₃		CH ₃	CH ₃	Ph3	Ph3	Ph3	Ph3	(CH ₂) ₃ Ph3	CH ₃	CH ₃	CH ₃		CH ₃	ı	C ₅ H ₁₁		CH ₃	-	CH ₃		СН3
1	Ľ		Α"		CH3		CH ₃	CH ₃	Ph3	Ph3	CH ₃	CH ₃	(CH ₂) ₃ Ph3	CH ₃	CH ₃	CH ₃	1	CH ₃	ı	C ₅ H ₁₁	ı	CH ₃	•	CH ₃	1	CH ₃
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		R5		R5	ェ	ı	FL5		FL5	-	FL5			т
	CyN1-R2		CyC1-R4		Ph2	Н	Tn5	Н	Tn6	Н	EdN	Н	Н	Н
c	CyN1-R1		CyC1-R3		エ	Н	Н	Н	H	Н	Н	I	Н	FL5
lable 13 (continued)	Ä		R'''		CH ₃	^ε нэ	$^{ m E}$ HO	$^{ m c}$ HO	^ε нэ	$^{ m c}$ HO	[£] НЭ	CH ₃	-	C_8H_{17}
lable	α.		π"		CH ₃		C ₈ H ₁₇							
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	CyN1				Pi		Pi		Pi		Pi		Pi	
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	Σ				格		Rh		Rh		Rh		Rh	
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Table 14

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209 Rh 3 0 Pi Tn1 H H H - - - 210 Rh 3 0 Pi Ph1 - - H Ph2 H FL5 H 211 Pt 2 0 Pi FL1 - - H H H - - - 212 Pt 2 0 Pi FL1 - - H H H - - - 213 Pt 2 0 Pi FL1 - - H H H - - - 214 Pt 2 0 Pi FL1 - - H FL4 H H H 215 Pt 2 0 Pi FL1 - - H DBT3 H H H 216 Pt 2 0 Pi FL1 - - H Ph2 H H H 217 Pt 2 0 Pi FL1 - - H FL4 H H H 217 Pt 2 0 Pi FL1 - - H Ph2 H H H 217 Pt 2 0 Pi FL1 - - H Ph2 H H H 218 Pt 2 0 Pi FL1 - - H Ph2 H H H 219 Pt 2 0 Pi Ph1 - - H FL4 H H H 219 Pt 2 0 Pi Ph1 - - H FL4 H H H 219 Pt 2 0 Pi Np2 - H FL4 H H H 219 Pt 2 0 Pi Np2 - H FL4 H H H 200 Pi Np2 - H FL4 H H H 219 Pt 2 0 Pi Np2 - H FL4 H H H 200 Pi Np2 - H FL4 H H H 201 Pt 2 0 Pi Np2 - H FL4 H H H 201 Pt 2 0 Pi Np2 - H FL4 H H H 201 Pt 2 0 Pi Np2 - H FL4 H H H 201 Pt 2 0 Pi Np2 - 201 Pt 2 0 Pi Np2 -
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210 Rh 3 0 Pi Ph1 H Ph2 H FL5 H 211 Pt 2 0 Pi FL1 H H 212 Pt 2 0 Pi FL1 H H 213 Pt 2 0 Pi FL1 H H 214 Pt 2 0 Pi FL1 H H H 215 Pt 2 0 Pi FL1 H PL4 H H H 216 Pt 2 0 Pi FL1 H PL4 H H H 217 Pt 2 0 Pi FL1 H DBT3 H H H H 218 Pt 2 0 Pi FL1 H Ph2 H H H 219 Pt 2 0 Pi FL1 H Ph2 H H H 210 Pi FL1 H Ph2 H H H 211 Pt 2 0 Pi FL1 H Ph2 H H H 212 Pt 2 0 Pi FL1 H Ph2 H H H 213 Pt 2 0 Pi FL1 H Ph2 H H H 214 Pt 2 0 Pi FL1 H Ph2 H H H 215 Pt 2 0 Pi FL1 H Ph2 H H H 216 Pt 2 0 Pi FL1 H Ph2 H H H 217 Pt 2 0 Pi FL1 H Ph2 H H H 218 Pt 2 0 Pi FL1 H Ph2 H H H 219 Pt 2 0 Pi Ph1 H Ph2 H H H 219 Pt 2 0 Pi Ph1 H Ph2 H H H 219 Pt 2 0 Pi Ph1 H Ph4 H H 219 Pt 2 0 Pi Ph1 H Ph4 H H 219 Pt 2 0 Pi Ph1 H FL4 H H H 219 Pt 2 0 Pi Ph1 H FL4 H H H H 219 Pt 2 0 Pi Ph1 H FL4 H H H H 219 Pt 2 0 Pi Ph1 H FL4 H H H H 219 Pt 2 0 Pi Ph1 H FL4 H H H H 219 Pt 2 0 Pi Ph1 H FL4 H H H H
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214 Pt 2 0 Pi FL1 -
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215 Pt 2 0 Pi FL1 H Ph2 H H H 216 Pt 2 0 Pi FL1 H FL4 H Ph3 H 217 Pt 2 0 Pi FL1 H Np4 H 218 Pt 2 0 Pi Ph1 H Np4 H 219 Pt 2 0 Pi Np2 - H H H H 40
30 216 Pt 2 0 Pi FL1 H FL4 H Ph3 H 217 Pt 2 0 Pi FL1 H Np4 H 35 218 Pt 2 0 Pi Ph1 H FL4 H H H 219 Pt 2 0 Pi Np2 H FL4 H H H 40
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217 Pt 2 0 Pi FL1 H Np4 H
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H H
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220 Pt 2 0 Pi FL1 H Ph2 H FL4 H
H H
221 Pt 2 0 Pi Ph1 H H
45 FL4 H H H H
222 Pt 2 0 Pi Ph1 H H
C ₂ H ₅ C ₂ H ₅ FL5 H H H H
223 Pt 2 0 Pi Np2 H Ph2 H FL4 H
H H
224 Pt 2 0 Pi FL2 CH ₃ CH ₃ H H
H H

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Table 15

M m m n GyN1 GyC1 R R' GyN1-R1 GyN1-R2 R5 F R R' GyN1-R2 GyC1-R3 GyC1-R4 R5 F R R' GyN1-R1 GyN1-R2 GyC1-R3 GyC1-R4 R5 F R R R' GyC1-R3 GyC1-R4 R5 F R R R R R GyN1-R1 GyN1-R2 GyC1-R3 GyC1-R3 GyC1-R3 GyC1-R4 R5 F R R R R R R R R R R R R R R R R R R			_		_						_					_			_					_		
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M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 Ph 2 0 Pi FL2 CH3 CH3 H H H Ph 2 0 Pi FL2 CH3 CH3 CH3 H	CyN1	R6	CyC1	R6	ı	1	1	ı	1	1	1	ı	ı	1	I	ı	Н	-	I	1	I	ı	I	ı	I	1
M m n CyM1 CyC1 R R° CyM1-R1 Pt 2 0 Pi FL2 CH3 CH3 H Pt 2 0 Pi FL2 CH3 CH3 H Pt 2 0 Pi FL2 CH3 Ph3 H Pt 2 0 Pi FL2 CH3 H H Pt 2 0 Pi FL2 CH3 Ph3 H Pt 2 0		R5		R5	ı		-				ı	-	1		I		т		I		I		I		I	
M m n CyN1 CyC1 R R' Pt 2 0 Pi FL2 CH3 CH3 Pt 2 0 Pi FL2 CH3 CH3 Pt 2 0 Pi FL2 CH3 Ph3 Pt 2 0 Pi FL2 CH3 CH3 Pt 2 0 Pi FL2 CH3 </td <td>CyN1-R2</td> <td></td> <td>CyC1-R4</td> <td></td> <td>CF₃</td> <td>I</td> <td>CF₃</td> <td>I</td> <td>I</td> <td>I</td> <td>I</td> <td>Н</td> <td>I</td> <td>I</td> <td>FL5</td> <td>I</td> <td>FL5</td> <td>I</td> <td>FL5</td> <td>I</td> <td>FL5</td> <td>I</td> <td>FL5</td> <td>I</td> <td>Ph2</td> <td>I</td>	CyN1-R2		CyC1-R4		CF ₃	I	CF ₃	I	I	I	I	Н	I	I	FL5	I	FL5	I	FL5	I	FL5	I	FL5	I	Ph2	I
M m n CyN1 CyC1 R Pt 2 0 Pi FL2 CH ₃ Pt 2 0	CyN1-R1		CyC1-R3		I	I	CF ₃	I	I	I	I	н	I	I	I	I	н	I	I	I	I	I	I	I	I	I
M m n CyN1 CyC1 Pt 2 0 Pi FL2 Pt 2	æ		R'''		CH ₃	1	CH ₃	1	Ph3	1	Ph3	-	(CH ₂) ₅ Ph3	1	CH ₃	CH ₃	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C ₈ H ₁₇	Ph3	Ph3	(CH ₂) ₅ Ph3	CH ₃	CH ₃	ı
W B <td>ď</td> <td></td> <td>"Α</td> <td></td> <td>CH₃</td> <td>1</td> <td>CH₃</td> <td>1</td> <td>Ph3</td> <td>1</td> <td>CH₃</td> <td>1</td> <td>(CH₂)₅Ph3</td> <td>1</td> <td>CH₃</td> <td>CH₃</td> <td>C₅H₁₁</td> <td>C₅H₁₁</td> <td>CH₃</td> <td>C₈H₁₇</td> <td>Ph3</td> <td>Ph3</td> <td>(CH₂)₅Ph3</td> <td>CH₃</td> <td>CH₃</td> <td>ı</td>	ď		"Α		CH ₃	1	CH ₃	1	Ph3	1	CH ₃	1	(CH ₂) ₅ Ph3	1	CH ₃	CH ₃	C ₅ H ₁₁	C ₅ H ₁₁	CH ₃	C ₈ H ₁₇	Ph3	Ph3	(CH ₂) ₅ Ph3	CH ₃	CH ₃	ı
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Table 15 (continued)		R7		R7	I	-	I	-	I	-	-	-	Н	н	
	CyN1	R6	CyC1	R6	Н	1	OCH ₂ C ₅ F ₁₁	1	$OC \equiv C \cdot C_7 H_{15}$	1	-	1	Ph3	Н	
		R5		R5	CF_3	ı	I	-	I	-	I	-	I	I	
	CyN1-R2		CyC1-R4		Ph2	I	Ph2	Н	Ph2	Н	An	I	FL4	Ph2	
	CyN1-R1		CyC1-R3		I	I	I	Н	I	Н	н	I	Н	I	
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Ta	œ		<u>"</u>		CH ₃	ı	CH ₃	-	CH ₃	-	CH ₃	-	CH ₃	ı	
	CyC1				FL2		FL2		FL2		FL2		FL2		
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| CyN1 | R6 | CyC1 | R6 | | Ph3 | Ph3 | Ph3 H | В Н В Н Н Н Н Н Н Н Н Н Н Н Н Н Н Н Н Н | В Н В Н В Н В Н В Н В Н В Н В Н В Н В Н | В Н В Н В Н Н Н Н Н Н Н Н Н Н Н Н Н Н Н | В Н В Н В Н В Н В Н В Н В Н В Н В Н В Н | | | | | |
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| CyN1-R2 | R5 | | | R2 | - R | χ <u>π</u> π | 8 <u>т</u> т т | 8 I I I I | 8 I I I I I I | 85 I I I I I I I | 8 I I I I I I I I I I I I I I I I I I I | S3 | С 3 Т Т Т Т Т Т Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т Т X 3 Т X 3 Т X 3 T X 3 | T T T T T T T T T T T T T T T T T T T | 3 T T T T T T T T T T T T T T T T T T T | C T T T T T T T T T T T T T T T T T T T | Т Т Т Т Т Т Т Т Т Т Т Т Т Т Т Т Т Т Т
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| | | <u>"</u> | | СН3 | | CH3 | CH ₃ | CH ₃ | CH ₃ Ph3 Ph3 (CH ₂) ₃ Ph3 | CH ₃ Ph ₃ Ph ₃ (CH ₂) ₃ Ph ₃ CH ₃ | CH ₃ Ph3 (CH ₂) ₃ Ph3 CH ₃ | CH ₃ Ph3 Ph3 (CH ₂) ₃ Ph3 CH ₃ CH ₃ | CH ₃ Ph3 (CH ₂) ₃ Ph3 CH ₃ CH ₃ CH ₃ | CH ₃ Ph3 Ph3 (CH ₂) ₃ Ph3 CH ₃ CH ₃ CH ₃ CH ₃ | CH ₃ Ph3 CH ₂) ₃ Ph3 CH ₃ CH ₃ CH ₃ CH ₃ | CH ₃ Ph3 (CH ₂) ₃ Ph3 CH ₃ CH ₃ CH ₃ CH ₃ CH ₃ CH ₃ | CH ₃ Ph3 Ph3 CH ₃ | CH ₃ Ph ₃ CH ₄ CH ₄ CH ₄ CG ₅ H ₄ 1 | CH ₃ Ph3 Ph3 CH ₃ CH ₄ | CH ₃ Ph ₃ Ph ₃ CH ₃ | CH ₃ Ph ₃ Ph ₃ CH ₄ | CH ₃ Ph ₃ Ph ₃ CH ₃ | CH ₃ Ph ₃ Ph ₃ CH ₄ | CH ₃ Ph ₃ Ph ₃ CH ₃ | CH ₃ Ph ₃ Ph ₃ CH ₃ |
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CyC1 FL5 R6 R6 I I I ı I FL5 R5 R5 I I I I CyN1-R2 CyC1-R4 Ph2 Tn5 I I I I CyN1-R1 CyC1-R3 エ I I I I I I エ I I Table 16 (continued) CH_3 CH3 CH3 <u>.</u> ď GH₃ CH₃ CH_3 CH₃ Ph3 <u>.</u> α CyC1 FL2 FL2 Cn1 CyN1 Ē Ē Ē Ē Ē ⊏ 0 0 0 0 0 Ε 7 2 0 $^{\circ}$ $^{\circ}$ Σ ద ₫ ₫ ₫ ₫ 256 252 253 255

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Table 17

								IUDIO II						
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N 1	
5											R5	R6	R7	R8
							R"	R"	CyC1-R3	CyC1-R4		CyC	C1	
											R5	R6	R7	R8
	257	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	Tn6	FL5	Н	-	-
10							CH ₃	CH ₃	Н	Н	-	-	-	-
	258	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	FL4	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
15	259	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	260	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	FL6	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
20	261	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	DBF2	FL5	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
	262	Pt	2	0	Pi	FL2	CH ₃	CH ₃	Н	DBF3	FL5	Н	Н	-
25							CH ₃	CH ₃	Н	Н	-	-	-	-
	263	Pt	2	0	Pi	Ph1	-	-	Н	Н	-	-	-	-
							C ₈ H ₁₇	C ₈ H ₁₇	FL5	Н	Н	Н	Н	-
20	264	Pt	2	0	Pi	Tn1	-	-	Н	Н	-	-	-	-
30							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
	265	Pt	2	0	Pi	Tn2	-	-	Н	Н	-	-	-	-
							CH ₃	CH ₃	FL5	Н	Н	Н	Н	-
35	266	Pt	2	0	Pi	Ph1	-	-	Н	Ph2	Н	FL5	Н	Н
							CH ₃	CH ₃	Н	Н	-	-	-	-
	267	Pt	2	0	Pi	FL3	-	-	Н	Н	-	-	-	-
40							-	-	Н	Н	-	-	-	-
40	268	Pt	2	0	Pi	FL3	-	-	Н	CF ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-
	269	Pt	2	0	Pi	DBF1	-	-	CF ₃	CF ₃	-	-	-	-
45							-	-	Н	Н	-	-	-	-
	270	Pt	2	0	Pi	DBT1	-	-	Н	CH ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-
50	271	Pd	2	0	Pi	FL1	-	-	Н	Н	-	-	-	-
00							-	-	Н	Н	-	-	-	-
	272	Pd	2	0	Pi	FL1	-	-	Н	CF ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-

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	R8		R8			I	ı		I	,			1		ı	I	ı	ı	1	I	ı	1	ı	1	ı
5	R7	2	R7	I		I	1	I	I			I	1	I	ı	I		ı	I	I	ı	1	1		
CyN1	R6	CyC1	R6	I		I		Ph3	I			I		I		FL4			I	FL4	ı			-	
	R5		R5	I		I	ı	I	I	I		I	1	I	ı	I		ı	I	I	ı	1	ı	1	
CyN1-R2		CyC1-R4		FL4	I	Ph2	н	FL4	Ph2	Np4	I	FL4	н	FL4	I	Ph2	I	н	Н	Ph2	Н	Н	н	CF_3	Т
CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	I	I	I	I	Н	I	I	FL4	I	I	I	I	Н	I
Z 2		<u></u>		ı		ı	ı		ı	ı		ı	ı	ı	ı	1	ı	ı	ı	ı	ı	CH ₃	ı	CH ₃	1
<u>«</u>		ğτ				ı	1					ı		ı	ı	-		1		ı		CH ₃		CH ₃	-
CyC1				FL1		FL1		FL1	I	FL1		Ph1		Np2		FL1		Ph1		Np2		FL2		FL2	
CyN1				ä		Ē		Ē		ä		ä		Ē		Ē		Ē		Ē		Ē		Ē	
٦				0		0		0		0		0		0		0		0		0		0		0	
٤				2		2		2		2		2		2		2		2		2		2		2	
Σ				Pd		Pd		Pd		Pd		Pd		Pd		Pd		Pd		Pd		Pd		Pd	
٥ N				273		274		275		276		277		278		279		280		281		282		283	

\geq	ш	2	ш.										
Cy	R6	Š	R6			I		Н	-	I		Н	
	R5		R5	1	ı	I	ı	Н	-	Н	ı	I	
CyN1-R2		CyC1-R4		I	I	FL5	I	FL5	Н	FL5	I	Ph2	I
CyN1-R1		CyC1-R3		I	I	I	I	I	I	I	I	Н	I
Ľ		<u>"</u>		(CH ₂) ₅ Ph3	ı	CH ₃	CH ₃	C ₅ H ₁₁	C ₅ H ₁₁	(CH ₂) ₅ Ph3	CH ₃	CH ₃	,
~		<u>"</u>		(CH ₂) ₅ Ph3	ı	CH ₃	CH ₃	C ₅ H ₁₁	C ₅ H ₁₁	(CH ₂) ₅ Ph3	CH ₃	CH ₃	
CyC1				FL2		FL2		FL2		FL2		FL2	
CyN1				Ē		<u>a</u>		Е		Pi		Ē	
u				0		0		0		0		0	
ш				2		2		2		2		2	
Σ				Pd		Pd		Pd		Pd		Pd	
No				284		285		286		287		288	
	M m n CyN1 CyC1 R	M m n CyN1 CyC1 R R' CyN1-R2 R5 R	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyC1-R3 CyC1-R4 CyC1-R4 CyC1-R4 CyC1-R4	M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyC1-R4 CyC1-R4 </td <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2<</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 R6 R7 R7</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 R6 R7 R7</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2<</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 CyN1-R3 CyN1-R3 R6 R7 R7</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3<</td> <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2<!--</td--><td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 CyN1-R3 CyN1-R3 R6 R7 R7</td><td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R2 CyC1-R3 CyC1-R3</td></td>	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2<	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 R6 R7 R7	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 R6 R7 R7	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2<	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 CyN1-R3 CyN1-R3 R6 R7 R7	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3<	M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 </td <td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 CyN1-R3 CyN1-R3 R6 R7 R7</td> <td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R2 CyC1-R3 CyC1-R3</td>	M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 CyN1-R3 CyN1-R3 R6 R7 R7	M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R2 CyC1-R3 CyC1-R3

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Table 19

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		CyN1 R6 R7 R		
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		CyC	1	
											R5	R6	R7	R8
	289	Pd	2	0	Pi	FL2	CH ₃	CH ₃	Н	Ph2	CF ₃	Н	Н	Н
10							-	-	Н	Н	-	-	-	-
	290	Pd	2	0	Pi	FL2	CH ₃	CH ₃	Н	FL4	Н	Ph3	Н	-
							-		H	Ph2	Η	Н	Ι	Н
15	291	Pd	2	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Ph3	Η	-
							CH ₃	CH ₃	H	Ph2	Η	Н	Ι	Н
	292	Pd	2	0	Pi	FL2	Ph3	Ph3	H	FL5	Η	Ph3	Ι	-
00							Ph3	Ph3	Н	Ph2	Н	Н	Ι	Н
20	293	Pd	2	0	Pi	FL2	CH ₃	CH ₃	H	FL5	Η	Ph3	Ι	-
							CH ₃	CH ₃	Η	DBT3	Η	Н	ı	-
	294	Pd	2	0	Pi	Ph1	-	-	Н	FL5	Н	Н	Ι	-
25							CH ₃	CH ₃	Н	Н	-	-	-	-
	295	Pd	2	0	Pi	Ph1	-	-	H	FL5	Н	Н	Ι	-
							C ₅ H ₁₁	C ₅ H ₁₁	Н	Н	-	-	1	-
30	296	Pd	2	0	Pi	FL2	CH ₃	CH ₃	Н	Ph2	Н	FL5	Η	Н
30							CH ₃	CH ₃	Н	Н	-	-	1	-
	297	Pd	2	0	Pi	FL2	CH ₃	CH ₃	Н	Tn5	FL5	Н	1	-
							CH ₃	CH ₃	Н	Н	-	-	1	-
35	298	Pd	2	0	Pi	Ph1	-	-	Н	Н	-	-	1	-
							C ₈ H ₁₇	C ₈ H ₁₇	FL5	Н	Н	Н	Η	-
	299	Pd	2	0	Pi	Ph1	-	-	Н	Ph2	Н	FL5	Ι	Н
40							CH ₃	CH ₃	Н	Н	-	-	1	-
70	300	Pd	2	0	Pi	DBT1	-	-	Н	CH ₃	-	-	•	-
							-	-	Н	Н	-	-	1	-

Table 20

								Iable 2	O					
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					CyN2	CyC2	R	R'	CyN2-R1	CyN2-R2		Су	N2	
10											R5	R6	R7	R8
							R"	R'''	CyC2-R3	CyC2-R4		Су	C2	
											R5	R6	R7	R8
15	301	lr	2	1	Pi	FL1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
20	302	lr	2	1	Pi	FL1	-	-	Н	FL4	Н	Н	Н	-
							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
25							-	-	Н	Н	-	-	-	-
	303	lr	2	1	Pi	FL1	-	-	Н	Ph2	Н	Н	Н	Н
							-	-	Н	Н	-	-	-	-
••					Pi	Ph1	-	-	Н	Н	-	-	-	-
30							-	-	Н	Н	-	-	-	-
	304	lr	2	1	Pi	FL1	-	-	Н	FL4	Н	Ph3	Н	-
							-	-	Н	Ph2	Н	Н	Н	Н
35					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
	305	lr	2	1	Pi	FL1	-	-	Н	Np4	Н	-	-	-
40							-	-	Н	Н	-	-	-	-
40					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
	306	lr	2	1	Pi	Ph1	-	-	Н	FL4	Н	Н	Н	-
45							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
50	307	lr	2	1	Pi	Np2	-	-	Н	FL4	Н	Н	Н	-
50							-	-	Н	Н	-		-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
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Table 20 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
											R5	R6	R7	R8
5							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					CyN2	CyC2	R	R'	CyN2-R1	CyN2-R2		Су	N2	
10											R5	R6	R7	R8
							R"	R'''	CyC2-R3	CyC2-R4		Су	C2	
											R5	R6	R7	R8
4	308	lr	2	1	Pi	FL1	-	-	Н	Ph2	Н	FL4	Н	Н
15							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
20	309	lr	2	1	Pi	Ph1	i	ı	Н	Н	ı	-	-	-
							-	-	FL4	Н	Н	Н	Н	-
					Pi	Ph1	i	ı	Н	Н	ı	-	-	-
25							i	ı	Н	Н	ı	-	-	-
25	310	lr	2	1	Pi	Ph1	ı	ı	Н	Ph2	Η	FL4	Н	Н
							i	ı	Н	Н	ı	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
30							-	-	Н	Н	-	-	-	-

				1																				
		R8		R8		R8		R8	ı	-	ı	ı	ı	-	-		ı	ı	ı	ı	ı	-	-	ı
	7	R7	2	R7	CyN2	R7	CyC2	R7					ı	-	-				ı	1		-	-	
	CyN1	R6	CyC1	R6	<u>ડે</u>	R6	Š	R6		-			ı	-	-	-		-	ı	1	1	-	-	
		R5		R5		R5		R5	,				ı			ı		ı	ı	1	ı		-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	CF ₃	I	I	I	CF ₃	I	I	エ	I	OC ₄ H ₉	н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	Н	I	I	I	Н	Н	Н	CF_3	Н	н	I	Н	Н	Н	I
Table 21	R'		R		žΥ		R		CH ₃	-	1		CH ₃	-	-	-	CH ₃	-	•	•	CH ₃	-	-	•
Ţ	Υ.		Ţ.		œ		Ţ.		CH ₃	ı	ı	1	CH ₃	1	1	1	СН3	1	ı	1	СН3	1	1	ı
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				<u>a</u>		<u>a</u>		Ε		Ρi		Ē		Pi		Pi		ŀЫ	
	u								-				_				_				1			
	ш								2				2				2				2			
	М								ı				<u>_</u>				ī				ı			
	oN								311				312				313				314			

		R8		R8		88		R8	ı			ı		ı	ı		ı		ı	ı		ı		
	Ę	R7	2	R7	72	R7	22	R7	ı				1					-			-		1	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	ı				1					-			-			
		R5		R5		R5		R5	ı			ı	1		ı		ı	-		ı				
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	I	エ	I	I	I	I	エ	I	I	エ	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Т	I	I	I	I	I	I	I	I	I	I	I	Н	I	I	I
1 (continued)	ìΥ		<u>"</u>		ά		۳. ۳.		C ₈ H ₁₇	1		ı	Ph3	1	1	1	Ph3	1	1	ı	(CH ₂) ₅ Ph3	1	1	ı
Table 21	œ		Ţ.		α.		<u>"</u>		C ₈ H ₁₇	ı	1	ı	Ph3	ı	ı	ı	CH ₃	-	-	ı	(CH ₂) ₅ Ph3	ı		
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ē		ï		Ë		Ē		Ē		Pi		Ē		Ē	
	Ч								~				~				_				_			
	Ε								2				2				2				2			
	Σ								<u>-</u>				۵				느				<u>-</u>			
	ž								315				316				317				318			

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	l		l		l											
	Z	R7	5	R7	CyN2	R7	CyC2	R7	ェ	1	ı	ı	ェ	ı	-	
	CyN1	R6	CyC1	R6	S	R6	Š	R6	I	1			I	-	-	
		R5		R5		R5		R5	I	1			I	1	-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	FL5	н	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	Н	I	Ö
Table 21 (continued)	ά		Α		Ϋ́				I	CH ₃	1		CH ₃	CH ₃		,
Table 21	œ		<u>"</u>		œ		Ľ.		I	CH ₃	ı	ı	CH ₃	CH ₃	1	
	CyC1				CyC2				FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ē		Pi		Ē		Pi	
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	٤								2				2			
	Σ								느				_			
	å								319				320			

		R8		R8		R8		R8	1	ı			I			ı	н		ı		I			
		R7		R7		R7		R7	I	-	-		I		-	-	Н		-	-	Н	-	-	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	I	ı	1	ı	OCH ₂ C ₅ F ₁₁	1	ı	1	OC≡C-C ₇ H ₁₅	1	ı	ı
		R5		R5		R5		R5	I				I			ı	т				I	-		
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I	Ph2	I	н	I	Ph2	I	I	I
22	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	Н	I	I	I	I	I	I	Н	I	I	I	т	н	Н	I
Table 22	R.		<u></u>		ά		<u></u>		C ₂ H ₅	C_2H_5	ı		CH ₃			ı	СН3	1		1	СН3	-	-	
	Я		<u>"</u>		۳		<u>"</u>		C ₂ H ₅	C_2H_5	ı		CH ₃			ı	СН3	ı		ı	СН3	-	-	
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ē		Pr		ā		Pr		Pi		Py1		Ē		Py2	
	u								-				-				-				-			
	ш								2				2				2				2			
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	No								321				322				323				324			

		R8		R8		R8		R8	ı	I	ı	ı	1	ı	1	ı	ı	1	1	ı	1	ı		
		R7		R7		R7		R7	Н	Н	-	ı	Н	-	-	-	Н	-	-	ı	Н	-	-	ı
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Ph3	I	1	ı	Ph3	Н	1	1	Н	1	_	1	I	1	-	1
		R5		R5		R5		R5	I	I	ı	ı	I	I	-	-	I	-	ı		I	ı		ı
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Ph2	н	I	FL5	Tn8	Н	Н	FL5	Н	I	I	FL5	I	Н	I
(continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	CH ₃	I	Т	I	Br	I	I	I	CF_3	I	I	Н	C ₅ H ₁₁
Table 22 (Ľ.		<u>"</u>		<u>r</u>		<u>"</u>		СН3	CH_3			CH_3	СН3	-	-	-	CH_3	-		-	Ph3	-	-
Ta	2		<u>r</u>		œ		<u>r</u>		СН3	CH_3		ı	CH_3	CH ₃	-	-		CH_3		-	-	Ph3		1
	CyC1				CyC2				FL2		Ph1	•	FL2		Ph1		Ph1		Ph1		Ph1		Ph1	
	CyN1				CyN2				Ξ		Pi		Pi		Pi		Ā		Ξ		Pi		Ē	
	u								-				1				1				1			
	Е								2				2				2				2			
	Σ								<u>_</u>				Ir				ı				Ir			
	o N								325				326				327				328			

		R8		R8		R8		R8	ı			ı	I		ı	
		R7		R7		R7		R7	I	1		ı	I		ı	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	FL5	ı	ı	1
		R5		R5		R5		R5	I			ı	I		ı	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I
Table 22 (continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	OCH ₃	I	I	I	ō
ble 22 (ī		<u>"</u>		Ē		<u></u>		ı	Ph3			CH ₃	СН3		1
<u>Ta</u>	œ		R"		œ		<u>.</u>		1	Ph3	-		CH ₃	CH ₃		
	CyC1				CyC2				Np2	•	Ph1		FL2		Ph1	
	CyN1				CyN2				ä		Pi		Ē		Ē	
	د								~				~			
	٤								2				2			
	Σ								ᅩ				ı			
	Š								329				330			

		88		88 88		88 88		88 88	1		ı	1	ı		ı	ı	ı	ı	ı		ı	ı	ı	ı
	7	R7	2	R7	72	R7	22	R7	ı	ı	ı	-	ı	-	ı	ı	-	ı	ı	ı	ı	-	ı	ı
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	1	ı	ı	1		1	ı		-	ı	ı	1		ı	ı	ı
		R5		R5		R5		R5	1	-	ı	-		-			-		ı			-		ı
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	CF ₃	I	CF ₃	I	I	I	Н	OC ₄ H ₉	I	I	Т	I	I	CH ₃
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		н	I	т	Н	CF_3	н	н	Н	Н	I	т	н	Н	I	н	I
Table 23	Ā		''		žΥ		R".		CH ₃		•	-	CH ₃	-	1	-	CH ₃	ı	•	1	C_4H_9	-	1	-
T	Δ.		ŗ.		œ		"A		CH ₃	ı	ı	-	СН3	1	ı		СН3	ı	ı	ı	C_4H_9		ı	ı
	CyC1				CyC2				FL2		Tn1		FL2		Tn1		FL2		Tn2		FL2		Tn3	
	CyN1				CyN2				Ē		Ē		Pi		Ē		Pi		Ē		Pi		Ē	
	u								~				_				1				_			
	ш								2				2				2				2			
	Σ								۲				<u>_</u>				lr				<u>_</u>			
	No								331				332				333				334			

		82		82		82		82										•	•		•	•	1	
	Z	R7	2	R7	N2	R7	CyC2	R7					I		ı		I	-			I		-	ı
	CyN1	R6	CyC1	R6	CyN2	R6	Š	R6	1	ı	ı	ı	I	ı	ı	ı	I	-		1	I		-	1
		R5		R5		R5		R5		1	ı		I		ı	1	I	-			I		-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	FL5	I	I	I	FL5	Н	I	I	FL5	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	I	I	I	I	Н	I	I	Н	Н	Н	Н	Н	Н	Н	I
(continued)	ř		R		Ϋ́		<u>"</u> "		C_8H_{17}		ı		н	СН3			CH ₃	CH_3	-		C ₁₅ H ₃₁	$C_{15}H_{31}$	-	ı
Table 23	۲		<u>"</u>		œ		į.		C ₈ H ₁₇	1	1		I	CH ₃	1	1	CH ₃	CH ₃	1	1	C ₁₅ H ₃₁	C ₁₅ H ₃₁	•	1
	CyC1				CyC2				FL2		Tn4		FL2		Np1		FL2		Np2		FL2		Pe1	
	CyN1				CyN2				Ē		Ē		Ē		Ē		Ē		Ē		Ē		Pi	
	_								~		•		~				_				~			
	Ε								2				2				2				2			
	Σ								ı				٢				ı				٢			
	8								335				336				337				338			

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Table 23 (continued)

CyN1 CyC1 CyC2 CyC2 CyC2 CyC2 CyC2 H H H H H H H H H H H H H		· ·	1 1
CyN		_	
			' '
R5 R5 T		Ι.	1 1
		Ξ .	1 1
CyN1-R2 CyN2-R4 CyC2-R4 FL5	Н -	FL5 H	Ι.
CyN1-R1 CyC2-R3 CyC2-R3	I I I	т	т
R R R R R R R R R R R R R R R R R R R		(CH ₂) ₅ Ph3 CH ₃	1 1
CH ₃ R R R CH ₃		(CH ₂) ₅ Ph3 CH ₃	1 1
CyC1	Cn1	FL2	Cn2
CyN ₂	Ē	Ē	Ē
c		-	
E 0		2	
Σ =		<u>-</u>	
o N		340	

Table 24

	88 88		88 88		R8		R8			,		I			ı		ı	,					ı
CyN1	R7	2	R7	CyN2	R7	CyC2	R7	I				I			ı				ı				ı
Cy	R6	CyC1	R6	Š	R6	Š	R6	I				I				I				I			
	R5		R5		R5		R5	I				I				I				I			ı
CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		DBT3	I	I	I	Ph2	I	I	I	Tn5	I	I	I	Np3	I	I	I
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	I	I	н	I	Н	I	I	т	Н
œ		''		ά		"		CH ₃		1		CH ₃		CH ₃		C ₃ H ₇	1	CH ₃		CH ₃		CH ₃	ı
œ		<u>"</u>		œ		Ţ.		CH ₃	1	1		CH ₃		CH ₃	ı	C ₃ H ₇	ı	CH ₃	ı	CH ₃	1	CH ₃	ı
CyC1				CyC2				FL2	I	FL1		FL2		FL2		FL2		FL2		FL2		FL2	
CyN1				CyN2				<u>a</u>		<u>a</u>		<u>a</u>		<u>a</u>		<u>a</u>		<u>a</u>		<u>a</u>		<u>a</u>	
_								_				-				_				-			
Ε								2				2				2				2			
Σ								느				느				느				느			
_S								341				342				343				344			

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Ph3

FL2

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 $(CH_2)_5Ph3$

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R7

R6

R5

CyC1

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R7

R6

R5

CyN2

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R6

R5

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R7

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CyC2

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	CyN1-R2	CyC1-R4	CyN2-R2	CyC2-R4	I	I	I	I	I	I	I	
	CyN1-R1	CyC1-R3	CyN2-R1	CyC2-R3	I	I	I	I	I	I	I	
4 (continued)	Ľ.	R	ά	 	C ₈ H ₁₇	1	(CH ₂) ₅ Ph3	ı	Ph3	1	C ₃ H ₇	
Table 24	ď	"Α	~	<u>"</u>	C ₈ H ₁₇	1	(CH ₂) ₅ Rh3		Ph3	1	C ₃ H ₇	
	CyC1		CyC2		FL2		FL2		FL2		FL2	
	CyN1		SyN2		Pi		Pi		Pi		Pi	

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	Ξ	ř	CyC1	ĬŒ.	CyN2	E E	CyC2	ĬZ.	-	'	'	'		'	'	'
	CyN1	R6	ò	R6	Š	R6	ò	R6	I	1		ı	I		ı	
		R5		R5		R5		R5	I	ı	ı	ı	I	ı	ı	,
	CyN1-R2	1	CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	FL5	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	Н	I	<u>-</u>
Table 24 (continued)	Ľ		<u>"</u> "		ď		<u>.</u>		I	CH ₃	ı	ı	CH ₃	CH ₃	ı	
Table 2 ⁴	~		ŗ.		~		ŗ.		I	CH ₃	ı		CH ₃	CH ₃		
	CyC1				CyC2				FL2		DBT1		FL2		Qn1	
	CyN1				CyN2				Pi		Pi		Pi		Pi	
	u								-				-			
	ш								2				2			
	Σ								느				ıl			
	oN N								349				350			

			_		_							_	_			_			_		_			_
		R8		R8		R8		R8	1	ı	ı		I	ı	ı	ı	I	-	ı	-	I	ı	1	ı
		R7		R7		R7		R7	I	ı			I	-	-		I	-	ı	-	I			
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Н	1	ı	ı	I	ı	ı	ı	OCH ₂ C ₅ F ₁₁	1	ı	1	OC≡C-C ₇ H ₁₅	ı	1	ı
		R5		R5		R5		R5	I	ı	ı		I			ı	I	-	ı	-	I	ı		
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I	Ph2	I	I	I	Ph2	I	I	I
3 25	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	Ph3	I	I	I	I	I	I	I	I
Table 25	Ά.		<u></u>		æ		<u></u>		C ₂ H ₅	C ₂ H ₅			СН3				CH ₃				CH ₃			
	R		<u>"</u>		ď		<u></u>		C_2H_5	C ₂ H ₅	ı		CH ₃			ı	CH ₃	-	ı	-	CH ₃	ı		
	CyC1				CyC2				FL2	•	Qn2	•	FL2		CZ	•	FL2		Ph1		FL2	ı	Ph1	
	CyN1				CyN2				Ξ		Pr		ä		Pr		Ξ		Ξ		ï		Py2	
	u								-		•		-				-				-			
	ш								2				2				2				2			
	М								ı				느				Rh				Rh			
	No								351				352				353				354			

		88		R8		R8		88	ı	ェ	ı	ı		ı		ı	ı		ı	ı	ı	ı	ı	
		R7		R7		R7		R7	I	I	,	1	I		-	,	ェ	-		ı	I			_
		ш.		ш.		<u>"</u>																		
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Ph3	I			Ph3	I	-	ı	I	-			I			
		R5		R5		R5		R5	I	I	ı		I	I	ı	ı	I	-	ı	ı	I	ı	,	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Ph2	I	Н	FL5	Tn8	Н	I	FL5	Н	Н	т	FL5	Н	Н	т
(continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	н	Ŧ	СН3	Н	Н	Н	Br	I	Н	Н	CF ₃	Н	Н	Н	C ₅ H ₁₁
Table 25 (Ά.		R		Z.		<u></u>		СН3	СН3			CH_3	CH_3	-		-	CH_3	-		-	Ph3	-	-
Та	œ		."A		œ		<u>r</u>		СН3	CH ₃			CH_3	CH_3	-	ı		CH_3			-	Ph3		-
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		Ph1		Ph1		Ph1		Ph1	
	CyN1				CyN2				Ē		Ξ		Pi		Pi		Pi		Ē		Pi		Ē	
	c								-				1	•			_				1			
	٤								2				2				2				2			
	Σ								Rh				Rh				Rh				Rh			
	Š								355				356				357				358			

		R8		R8		R8		R8	٠	'		'	I	'	•	
		R7		R7		R7		R7	I		ı	ı	I	1		
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	1	ı	FL5	ı	ı	ı
		R5		R5		R5		R5	I		ı	ı	I		ı	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I
Table 25 (continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	OCH ₃	I	I	I	ō
ble 25 (ī		<u></u>		Ē		<u></u>			Ph3		ı	СН3	СН3		
Ta	œ		<u></u>		œ		<u>r</u>		ı	Ph3	ı		CH ₃	СН3	ı	ı
	CyC1				CyC2				Np2		Ph1		FL2		Ph1	
	CyN1				CyN2				<u>i</u>		Ε		Ε		Ε	
	u								_				_			
	٤								2				2			
	Σ								格				格			
	Š								359				360			

Table 26

361 Ir 20 362 Ir	1 2	CyN2 Pi	CyC1 CyC2 FL1 Ph1	R R" R	R' R'' R''	CyN1-R1 CyC1-R3 CyN2-R1 CyC2-R3 H H	CyN1-R2 CyC1-R4 CyN2-R2 CyC2-R4 H	R5 R5 R5 -	Cy R6 Cy R6 Cy R6 Cy R6 -	R7 C1 R7 N2 R7	R8 R8 R8
10 361 Ir 20 362 Ir		Pi	FL1	R R"	R' R''' -	CyN2-R1 CyC2-R3	CyN2-R2 CyC2-R4	R5 R5 R5	Cy R6 Cy R6 Cy R6	C1 R7 N2 R7 C2	R8 R8
20 362 Ir		Pi	FL1	R R"	R' R''' -	CyN2-R1 CyC2-R3	CyN2-R2 CyC2-R4	R5 R5	R6 Cy R6 Cy R6	R7 N2 R7 C2 R7	R8
361 Ir 20 362 Ir		Pi	FL1	R"	R''' -	CyC2-R3	CyC2-R4	R5 R5	Cy R6 Cy R6	N2 R7 C2 R7	R8
361 Ir 20 362 Ir		Pi	FL1	R"	R''' -	CyC2-R3	CyC2-R4	R5 -	R6 Cy R6	R7 C2 R7	R8
361 Ir 20 362 Ir		Pi		-	-	Н	Н	R5 -	Cy R6	C2 R7	R8
20 362 Ir		Pi		-	-	Н	Н	-	R6	R7	
20 362 Ir		Pi		-	-			-			
20 362 Ir		Pi		-	-				-	-	_
362 Ir	1 2		Ph1	-		Н	Н	_			ĺ
362 Ir	1 2		Ph1		_			_	-	-	-
362 Ir	1 2	Pi			-	Н	Н	-	-	-	-
362 Ir	1 2	Pi		-	-	Н	Н	-	-	-	-
			FL1	-	-	Н	FL4	Н	Н	Н	-
				-	-	Н	Н	-	-	-	-
	1	Pi	Ph1	-	-	Н	Н	-	-	-	-
25				-	-	Н	Н	-	-	-	-
363 Ir	1 2	Pi	FL1	-	-	Н	Ph2	Н	Н	Н	Н
				-	-	Н	Н	-	-	-	-
20		Pi	Ph1	-	-	Н	Н	-	-	-	-
30				-	-	Н	Н	-	-	-	-
364 Ir	1 2	Pi	FL1	-	-	Н	FL4	Н	Ph3	Н	-
				-	-	Н	Ph2	Н	Н	Н	Н
35		Pi	Ph1	-	-	Н	Н	-	-	-	-
				-	-	Н	Н	-	-	-	-
365 Ir	1 2	Pi	FL1	-	-	Н	Np4	Н	-	-	-
40				-	-	Н	Н	-	-	-	-
40		Pi	Ph1	-	-	Н	Н	-	-	-	-
				-	-	Н	Н	-	-	-	-
366 Ir	1 2	Pi	Ph1	-	-	Н	FL4	Н	Н	Н	-
45				-	-	Н	Н	-	-	-	-
		Pi	Ph1	-	-	Н	Н	-	-	-	-
				-	-	Н	Н	-	-	-	-
367 Ir	1 2	Pi	Np2	-	-	Н	FL4	Н	Н	Н	-
				-	-	Н	Н	-	-	-	-
		Pi	Ph1	-	-	Н	Н	-	-	-	-
				-	-	Н	Н	-	-	-	-

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Table 26 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
											R5	R6	R7	R8
5							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					CyN2	CyC2	R	R'	CyN2-R1	CyN2-R2		Су	N2	
10											R5	R6	R7	R8
							R"	R'''	CyC2-R3	CyC2-R4		Су	C2	
											R5	R6	R7	R8
45	368	lr	1	2	Pi	FL1	ı	-	Н	Ph2	Η	FL4	Н	Н
15							ı	-	Н	Н	ı	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
20	369	lr	1	2	Pi	Ph1	ı	-	Н	Н	-	-	-	-
							-	-	FL4	Н	Н	Н	Н	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
25							ı	-	Н	Н	-	-	-	-
25	370	lr	1	2	Pi	Ph1	-	-	Н	Ph2	Н	FL4	Н	Н
							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
30							-	-	Н	Н	-	-	-	-

		R8		88		R8		88	ı		ı	1	ı	1	ı	-	ı	ı	ı	1	ı	ı	ı	ı
	_	R7	_	R7	21	R7	2	R7			ı	,	1		ı		-	,			1		1	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	1		ı	,	ı	_	ı		-		ı	_	1	-	-	
		R5		R5		R5		R5	1	'	'	'	1	-	'	'	-	ı	'	-	'	•	'	'
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		н	Н	I	I	CF ₃	Н	I	Н	CF_3	I	н	Н	Н	OC_4H_9	Н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	Н	Н	I	Н	Н	I	Н	CE_3	Н	Н	Н	Н	Н	Н	I
Table 27	Ŗ		R		R.		R"'		CH ₃		•		CH ₃	-		-	CH ₃		-	-	CH ₃		-	-
L	Я		<u>"</u>		æ		R."		CH ₃	1	ı	1	CH ₃		1	ı	CH ₃	ı	ı		CH ₃	1	1	ı
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ē		Ρi		Ξ		Ε		Pi		Ρi		Pi		Pi	
	u								7				7				2				2			
	ш								~				-				1				-			
	Σ								<u>-</u>				<u>-</u>				lr				ı			
	No								371				372				373				374			

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	7	R7	2	R7	72	R7	22	R7	ı				1					-			-		-	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	ı	1		ı	1	ı	ı	ı	ı	-	1	ı	-	ı	-	
		R5		R5		R5		R5	ı									-			-		-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	I	I	I	I	I	I	I	I	Н	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	Н	I	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	I
7 (continued)	ĒΥ		"		Ϋ́		R"		C ₈ H ₁₇	1	-	•	Ph3	-	•	1	Ph3	-	-	•	$(CH_2)_5$ Ph3	-	-	-
Table 27	œ		<u></u>		~		<u>.</u>		C ₈ H ₁₇	ı		ı	Ph3	1	ı	ı	СН3		1	ı	(CH ₂) ₅ Ph3	1	1	ı
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ξ		Pi		Pi		Pi		Ρi		ŀd		ŀЫ		ŀ	
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	8								375				376				377				378			

		R8		R8		R8		R8			-			-		
	Σ	R7	2	R7	CyN2	R7	CyC2	R7	I				I			
	CyN1	R6	CyC1	R6	ਠੋ	R6	ò	R6	I			ı	I		ı	,
		R5		R5		R5		R5	I			ı	I		ı	,
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	FL5	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	Н	Н	Н	Н	Н	ō
lable 27 (continued)	ά		 		ά		<u>"</u> "		I	CH ₃	1	•	CH ₃	CH ₃		
lable 2	œ		Ţ.		œ		ŗ.		I	CH ₃	ı	ı	CH ₃	СН3	ı	
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		R7		R7		R7		R7	Н	-	-	-	Н	-	-		Н	-	-		Н		-	-
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Н	-	1	1	Н	1	-	•	$OCH_2C_5F_{11}$	-	-	1	$OC \equiv C \text{-} C_7 H_{15}$	1	-	1
		R5		R5		R5		R5	Н	-	-	-	н	-	-	ı	н	-	-		т	1	-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Н	I	I	Ph2	I	Н	I	Ph2	I	Н	I	Ph2	I	Н	I
Table 28	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	Н	I	I	Н	I	Н	I	I	Т	Н	I	Н	I	Н	I
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	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
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		R7		R7		R7		R7	I	I		ı	I	ı			I	1		ı	I		ı	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Ph3	I	1	ı	Ph3	I	1	1	I	ı	ı	ı	I	1	1	1
		R5		R5		R5		R5	I	I		ı	I	I			I	1	-	ı	Н		ı	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Ph2	I	I	FL5	Tn8	I	I	FL5	I	I	I	FL5	I	I	I
(continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	CH ₃	I	I	I	Br	I	I	I	CF ₃	I	I	I	C ₅ H ₁₁
Table 28 ('n		<u>"</u>		Ē		<u>"</u>		СН3	СН3		ı	СН3	СН3			ı	СН3		ı		Ph3	ı	
Ta Ta	٣		R."		œ		<u>r</u>		CH ₃	CH ₃	ı		CH ₃	CH ₃	ı	ı	ı	CH ₃			-	Ph3	ı	-
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CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	осн3	I	I	I	ō
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	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2	M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 R5 R6 R7	M m n CyN1 R R CyN1-R1 CyN1-R2 R5 R6 R7 N	M m n cyN1 R R CyN1-R1 CyN1-R2 R5 R6 R7 N	M m n CyN1 R R CyN1-R1 CyN1-R2 R5 R6 R7 R7 1	M m n CyN1 R' R' CyN1-R1 CyN1-R2 R5 R6 R7 M	M m n CyN1 R' CyN1-R1 CyN1-R2 R5 R6 R7 1	M m n CyN1 R' CyN1-R1 CyN1-R2 CYN1-R2 CYN1-R2 CYN1-R2 CYN1-R3 R3 R4 R7 R4 R5 R6 R7 R4 R7 R4 R4 R5 R6 R7 R7 R4 R7 R4 R7 R4 R7 R4 R7 R7 R7 R4 R4	M m n CyN1 R' CyN1-R1 CyN1-R1 CyN1-R2 R5 R6 R7 1 1 2 1 </td <td>M m n CyN1 R° R° CyN1-R° CYN1</td> <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2<!--</td--><td>M m n CyN1 R R CyN1-R1 CyN1-R2 R CyN1-R2 R CyN1-R2 R CyN1-R2 R</td><td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2<</td><td>M m m CyN1 CyC1 R' CyN1-R3 CyN1-R3 CyN1-R4 Cy</td><td>M m m m cyn1 cyc1 R° cyn1-R° cyn1-R°<</td></td>	M m n CyN1 R° R° CyN1-R° CYN1	M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 </td <td>M m n CyN1 R R CyN1-R1 CyN1-R2 R CyN1-R2 R CyN1-R2 R CyN1-R2 R</td> <td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2<</td> <td>M m m CyN1 CyC1 R' CyN1-R3 CyN1-R3 CyN1-R4 Cy</td> <td>M m m m cyn1 cyc1 R° cyn1-R° cyn1-R°<</td>	M m n CyN1 R R CyN1-R1 CyN1-R2 R CyN1-R2 R CyN1-R2 R CyN1-R2 R	M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2<	M m m CyN1 CyC1 R' CyN1-R3 CyN1-R3 CyN1-R4 Cy	M m m m cyn1 cyc1 R° cyn1-R° cyn1-R°<

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	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6			1	,		,			-		ı		,			
		R5		R5		R5		R5	,		ı				-		-		ı					
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		Н	I	CF ₃	I	CF ₃	I	Н	I	Н	OC ₄ H ₉	I	I	т	I	I	CH ₃
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	Н	н	I	CF ₃	I	Н	Н	Н	Н	н	I	Н	Н	I	I
Table 29	R'		R'''		R'		R"'		CH ₃	-	•		CH ₃	•	-	-	CH_3	-	•	•	C_4H_9	-		-
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	CyC1				CyC2				FL2		Tn1		FL2		Tn1		FL2		Tn2		FL2		Tn3	
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		R8		82		82		82	ı	٠					•			•				•	•	
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	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		Н	I	I	I	FL5	Н	I	I	FL5	Н	I	I	FL5	Н	Н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	Н	I	Н	Н	Н	Н	н	I	Н	н	Н	Н	Н	Н	I
Table 29 (continued)	Ľ		"		Ϋ́		 		C ₈ H ₁₇	•		ı	H	CH ₃	1	•	CH ₃	CH_3	,	ı	C ₁₅ H ₃₁	$C_{15}H_{31}$	-	
Table 29	~		<u></u>		~		ŗ.		C ₈ H ₁₇	1	1	ı	I	CH ₃	ı	1	CH ₃	CH ₃	1	ı	C ₁₅ H ₃₁	C ₁₅ H ₃₁	-	1
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| | M m n CyN1 CyC1 R | M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN R5 R6 | M m n cyn1 cyc1 R R Cyn1-R1 Cyn1-R2 Cyn1-R2 Cyn1-R2 Cyn1-R2 R6 R6 R6 R6 Cyc2 R6 < | M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 R5 R6 1 | M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 </td <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 R F CyC1 n</td> <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2<!--</td--><td>M m n CyN1 CyC1 R R CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R4 R R CyC1-R4 R R CyC1-R4 R CyC1-R4 R CyC1-R4 R</td><td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2<!--</td--><td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3<!--</td--><td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R1 CyN1-R2 CyN1-R2</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CYC1-R3 CYC1-R4 R R CYC1-R4 R R CYC1-R4 R R R CYC1-R4 R</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN2-R2 CyN2-R2<</td><td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R4 CyC2 R CyC2 R CyC2 R CyC2 R R CyC2-R3 CyC2-R4 R CyC2 R<td>M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1</td></td></td></td></td> | M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 R F CyC1 n | M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 </td <td>M m n CyN1 CyC1 R R CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R4 R R CyC1-R4 R R CyC1-R4 R CyC1-R4 R CyC1-R4 R</td> <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2<!--</td--><td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3<!--</td--><td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R1 CyN1-R2 CyN1-R2</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CYC1-R3 CYC1-R4 R R CYC1-R4 R R CYC1-R4 R R R CYC1-R4 R</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN2-R2 CyN2-R2<</td><td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R4 CyC2 R CyC2 R CyC2 R CyC2 R R CyC2-R3 CyC2-R4 R CyC2 R<td>M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1</td></td></td></td> | M m n CyN1 CyC1 R R CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R4 R R CyC1-R4 R R CyC1-R4 R CyC1-R4 R CyC1-R4 R | M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 </td <td>M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3<!--</td--><td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R1 CyN1-R2 CyN1-R2</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CYC1-R3 CYC1-R4 R R CYC1-R4 R R CYC1-R4 R R R CYC1-R4 R</td><td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN2-R2 CyN2-R2<</td><td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R4 CyC2 R CyC2 R CyC2 R CyC2 R R CyC2-R3 CyC2-R4 R CyC2 R<td>M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1</td></td></td> | M m n CyN1 CyC1 R R CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R3 CyN1-R3 </td <td>M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R1 CyN1-R2 CyN1-R2</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CYC1-R3 CYC1-R4 R R CYC1-R4 R R CYC1-R4 R R R CYC1-R4 R</td> <td>M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN2-R2 CyN2-R2<</td> <td>M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R4 CyC2 R CyC2 R CyC2 R CyC2 R R CyC2-R3 CyC2-R4 R CyC2 R<td>M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1</td></td> | M m n CyN1 CyC1 R R' R' CyN1-R1 CyN1-R1 CyN1-R2 CyN1-R2 | M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CYC1-R3 CYC1-R4 R R CYC1-R4 R R CYC1-R4 R R R CYC1-R4 R | M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN2-R2 CyN2-R2< | M m n CyN1 CyC1 R R° CyN1-R1 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyN1-R2 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R3 CyC1-R4 CyC2 R CyC2 R CyC2 R CyC2 R R CyC2-R3 CyC2-R4 R CyC2 R <td>M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1</td> | M m m cyN1 CyC1 R R' CyN1-R1 CyN1-R2 CYC1-R4 R CYC2 1 |

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		R8		R8		R8		R8			ı		I	1	1				1		1		1	
	CyN1	R7	CyC1	R6 R7 CyN2	N2	R5 R6 R7 CyC2	CyC2	R7	I	ı	ı	1	I	1	ı	ı	1	ı	ı		ı	ı	1	
		R6			Ç			R6	I		ı	1	I	1	-	-	Н	,	1	-	I	-		
		R5		R5				R5	I		ı		I	1	-	-	Н		1	-	I	-	-	•
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		DBT3	Н	н	Н	Ph2	Н	Н	Н	Tn5	I	Н	Н	Np3	Н	Н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	I	I	I	Н	I	Н	I	Н	I	I	I	Н	I	Н	I
Table 30	ĕ		''		žΥ		R'''		CH ₃	1		1	CH ₃		CH ₃	•	C_3H_7	1	CH ₃	-	CH ₃	-	CH ₃	1
T	α.		<u>"</u>		œ		R.		CH ₃	ı	ı	ı	CH ₃	1	CH ₃		C ₃ H ₇	ı	CH ₃	ı	CH ₃	,	CH ₃	
	CyC1			CyC2					FL2		FL1		FL2		FL2		FL2		FL2		FL2		FL2	
	CyN1				CyN2				Ē		Ē		ï		Pi		Pi		Ē		Pi		Ξ	
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_		R8	88	χ Υ	R8		82		1	ı	ı		ı				1			1	•			
	5	R7	2	R7	72	R7	CyC2	R7	ı			ı	ı	ı	ı	ı	ı		ı	ı	-		-	ı
	CyN1	R6	CyC1	R6	CyN2	R6	Cy	R6		ı		ı	ı	ı	ı	ı	ı	ı	ı		-	1		ı
		R5		R5	R5		R5		1	ı	ı	1	ı	ı	ı	ı		ı		-	ı	1	ı	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	I	エ	I	I	I	I	I	I	H	I	Н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	н	I	I	I	I	I	I	I	I	I	Н	I	Н	I
(continued)	ĬĽ		А		Ľ		 Т.		C ₈ H ₁₇	ı	(CH ₂) ₅ Ph3	ı	Ph3	ı	C ₃ H ₇	ı	Ph3	ı	ı	ı	(CH ₂) ₅ Ph3	1	-	ı
Table 30	œ		<u>"</u>		ď		<u>"</u>		C ₈ H ₁₇	ı	(CH ₂) ₅ Ph3	ı	Ph3	ı	C ₃ H ₇	ı	CH ₃	ı	ı		$(CH_2)_5Ph3$			ı
	CyC1	CyC1			CyC2				FL2		FL2		FL2		FL2		FL2		FL3		FL2		DBF1	
	CyN1				CyN2				Ē		Ē		Ξ		Ē		Ē		Ξ		Ē		Ξ	
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	o Z						405				406				407				408					

Table 30 (continued)		R8	CyC1	R6 R7 R8	7S	R8		R8	ı	-	-		-	-		
	F	R7				R7	CyC2	R7	I	ı		ı	I	ı	ı	
	CyN1	R6			<u>ဂ</u> ်	R6	Š	R6	I	ı		ı	I	ı	ı	
		R5		R5		R5		R5	I	1		ı	I	ı	ı	
	CyN1-R2	•	CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	FL5	I	I	I
	CyN1-R1	CyN1-R1			CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	ō
	Ľ	ŭ			ĬZ.		<u>"</u>		I	CH ₃	ı	ı	CH ₃	CH ₃	ı	ı
	ď		ŗ.		~		Ţ.		I	CH ₃	-	ı	CH ₃	CH ₃	ı	ı
	CyC1				CyC2				FL2		DBT1		FL2		Qn1	
(continued)	CyN1				CyN2				Pi		Pi		Pi		Pi	
	С								2				2		•	
	E								-				1			
	Σ								느				ı			
	_S								409				410			

Table 31

	R8		R8		R8		R8		ı	ı		I			ı	I	ı	ı		I	ı	ı	ı
CyN1	R7	CyC1 R6 R7	R7		R7		R7	I	1			I				I	ı	ı		I	ı		
	R6		R6	CyN2	R6	CyC2	R6	I	1	1	1	I	1	1	ı	OCH ₂ C ₅ F ₁₁	1	1	ı	OC≡C-C ₇ H ₁₅	ı	1	1
	R5		R5		R5		R5	I	ı	ı		I				I	-	ı		I	ı	ı	ı
CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I	Ph2	I	I	I	Ph2	I	I	I
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	Ph3	I	I	I	I	I	I	I	I
ĸ		۳ "		ī		۳. ایا		C_2H_5	C_2H_5			СН3				СН3				СН3			
œ		<u>"</u>		ď		בֿ		C ₂ H ₅	C ₂ H ₅	ı	1	CH ₃	1	1	ı	СН3	-	ı		СН3	ı	ı	ı
CyC1				CyC2				FL2		Qn2		FL2		CZ	•	FL2		Ph1		FL2		Ph1	
CyN1				CyN2				<u>a</u>		Pr		ā		Pr		<u>a</u>		Ε		<u>a</u>		Py2	
_								2				2				2				2			
Ε								-				-				-				-			
Σ								느				_				格				格			
Š								411				412				413				414			

		R8		R8		% %		R8		エ					•	1	•	•	•		•		•	•
		R7		R7		R7		R7	н	Н	-	ı	I	-	-	-	н	-	-		Н	-		-
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Ph3	I	ı	ı	Ph3	I	1	ı	Н	1	1	ı	I	ı	•	
		R5		R5		R5		R5	I	I		ı	I	I			I	-			I			
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Ph2	I	I	FL5	Tn8	I	Н	FL5	н	I	I	FL5	I	Т	I
(continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	CH ₃	I	Т	I	Br	Н	I	I	CF ₃	I	I	Н	C ₅ H ₁₁
Table 31 (Ľ.		<u>"</u>		<u>r</u>		<u>"</u>		СН3	CH_3			СН3	СН3	-	-	-	CH_3	-		-	Ph3	-	-
Ta	Υ.		<u>.</u>		~		<u>r</u>		CH ₃	CH_3		ı	CH ₃	СН3	-	-	-	CH_3			-	Ph3	-	-
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		Ph1		Ph1		Ph1		Ph1	
	CyN1				CyN2				Ē		Pi		Ē		Pi		Pi		Б		Pi		Ē	
	С								2				2				2				2			
	ш								1				-				1				1			
	Σ								Rh				Rh				Rh				Rh			
	o N								415				416				417				418			

		R8		82		82		R8	'	'	1	'	エ	'	'	
		R7		R7		R7		R7	I		1	ı	I			
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	FL5	1	ı	ı
		R5		R5		R5		R5	I		ı	ı	I		ı	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I
Table 31 (continued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	OCH ₃	I	I	I	ō
ble 31 (ī		<u></u>		Ē		<u></u>			Ph3		ı	СН3	СН3		
Та	œ		<u>r</u>		œ		ŗ.		ı	Ph3	ı	ı	СН3	СН3	ı	
	CyC1				CyC2				Np2		Ph1		FL2		Ph1	
	CyN1				CyN2				<u>i</u>		<u>i</u>		Ε		Ε	
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	Σ								格				R			
	8								419				420			

Table 32

								Table 32	=					
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
5											R5	R6	R7	R8
							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					CyN2	CyC2	R	R'	CyN2-R1	CyN2-R2		Су	N2	
10											R5	R6	R7	R8
							R"	R'''	CyC2-R3	CyC2-R4		Су	C2	
											R5	R6	R7	R8
15	421	Pt	1	1	Pi	FL1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	•	-	-	-
					Pi	Ph1	ı	-	Н	Н	ı	-	-	-
00							1	-	Н	Н	ı	-	-	-
20	422	Pt	1	1	Pi	FL1	-	-	Н	FL4	Η	Н	Н	-
							ı	-	Н	Н	ı	-	-	-
					Pi	Ph1	ı	-	Н	Н	ı	-	-	-
25							-	-	Н	Н	1	-	-	-
	423	Pt	1	1	Pi	FL1	ı	-	Н	Ph2	Η	Н	Н	Н
							ı	-	Н	Н	ı	-	-	-
30					Pi	Ph1	-	-	Н	Н	-	-	-	-
30							-	-	Н	Н	-	-	-	-
	424	Pt	1	1	Pi	FL1	-	-	Н	FL4	Н	Ph3	Н	-
							-	-	Н	Ph2	Н	Н	Н	Н
35					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
	425	Pt	1	1	Pi	FL1	-	-	Н	Np4	Н	-	-	-
40							-	-	Н	Н	-	-	-	-
40					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
	426	Pt	1	1	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
45							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
50	427	Pt	1	1	Pi	FL2	CH ₃	CH ₃	Н	CF ₃	-	-	-	-
50							-	-	Н	Н	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
55		•			•			•	•					•

Table 32 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
											R5	R6	R7	R8
5							R"	R"'	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					CyN2	CyC2	R	R'	CyN2-R1	CyN2-R2		Су	N2	
10											R5	R6	R7	R8
							R"	R'''	CyC2-R3	CyC2-R4		Су	C2	
											R5	R6	R7	R8
45	428	Pt	1	1	Pi	FL2	CH ₃	CH ₃	CF ₃	CF ₃	1	-	-	-
15							-	-	Н	Н		-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	1	-	-	-
20	429	Pt	1	1	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
							-	-	Н	OC ₄ H ₉	-	-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
05							-	-	Н	Н		-	-	-
25	430	Pt	1	1	Pi	FL2	C ₈ H ₁₇	C ₈ H ₁₇	Н	Н	-	-	-	-
							-	-	Н	Н		-	-	-
					Pi	Ph1	-	-	Н	Н	-	-	-	-
30							-	-	Н	Н	-	-	-	-

		R8		R8		88 88		88	1	ı			I	1		ı	I	ı			I	ı	ı	
		R7		R7		R7		R7	I	-	ı		I	1		ı	エ	,		-	I	-	-	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	I	ı	1	ı	OCH ₂ C ₅ F ₁₁	1	ı	1	OC≡C-C ₇ H ₁₅	1	1	ı
		R5		R5		R5		R5	I		ı		I		1	ı	I	,		-	I	-	-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I	Ph2	I	I	I	Ph2	I	Н	I
33	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	I	Н	I	I	H	т	I	Н	I
Table 33	ά		<u>"</u>		ùΥ		<u>"</u>		C ₂ H ₅	C ₂ H ₅	ı		CH ₃	ı	1	ı	CH ₃	ı	1	-	CH ₃	-	-	1
	2		<u>"</u>		ď		Ľ.		C ₂ H ₅	C_2H_5	ı		CH ₃	ı	ı	-	СН3	ı	-	-	сн ^з	-	-	-
	CyC1				CyC2				FL2		Ph1		FL2		Ph1		FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Pi		Pr		Pi		P		Pi		Py1		Pi		Py2	
	C								-				~				-				_			
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	_o N								431				432				433				434			

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Table

n CyN1 CyC1 R	CyC1		L	~	ř	CyN1-R1	CyN1-R2	20	CyN1	P 2	80
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				בֿ	<u>۳</u>	CyC1-R3	CyC1-R4		CyC1		
l								R5	R6	R7	R8
		CyN2	CyC2	Ж	Ŗ	CyN2-R1	CyN2-R2		CyN2		
								R5	R6	R7	R8
				<u>"</u>	 	CyC2-R3	CyC2-R4		CyC2		
								R5	R6	R7	88
	-	Pi	FL2	CH ₃	CH ₃	I	FL5	I	Ph3	I	ı
			1	CH ₃	CH ₃	I	Ph2	I	Н	I	I
		Pi	Ph1	-	1	Н	Н	ı	-	-	
				ı	ı	CH ₃	I	ı	1	ı	ı
	-	Pi	FL2	CH ₃	СН3	Н	Н	1	-		1
				1	1	I	Н	ı	-		ı
	•	Pi	Tn1	ı	1	I	CF ₃	ı	-	1	1
				-	1	Н	Н		-	-	ı
—	-	Pi	FL2	CH ₃	СН3	CF ₃	CF ₃	-	-	-	ı
				-	-	Н	Н	-	-	-	
		Pi	Tn1	-	1	Н	Н	ı	-	-	ı
				-	1	I	н	ı	-	-	ı
_	-	Pi	FL2	CH ₃	СН3	Н	Н	1	-		1
				1	-	Н	OC_4H_9	ı	-	-	ı
	•	Pi	Tn2	-	-	Н	Н	1	-		1
				ı		I	I	ı	1	ı	ı

No M m n CyN1 CyC1 R R" CyN1-R1 CyN1-R2 R5 R6 R7			R8		82		82		R8	'	'	1	'	'	'	'	'
M m n CyN1 CyC1 R" CyC1-R1 CyN1-R2 R5 R R5 CyC1-R4 R5 R R" CyC1-R3 CyC1-R4 R5 R R" CyC1-R3 CyC2-R4 R5 R R" CyC2-R3 CyC2-R4 R5 R R R" CyC2-R4 R5 R R R" CyC2-R4 R5 R R R R R R R R R R R R R R R R R			R7		R7		R7		R7	ı		1	ı			ı	
M m n CyN1 CyC1 R R' CyN1-R1 CyN1-R2 CyN1-R2 CyN2 CyC2 R R' CyN2-R1 CyN2-R2 CyC2-R4 CyN2-R2 CyC2-R4 Cy		CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	ı	ı	ı	ı	ı	1	ı	1
M m n CyN1 CyC1 R R" CyC1-R3 CyN2 CyC2 R R" CyN2-R1 CyN2 CyC2 R R" CyN2-R1 R" CyN2-R1 R" CyN2-R1 Pt 1 1 Pi FL2 C ₄ H ₉ C ₄ H ₉ H Pt 1 1 Pi FL2 C ₈ H ₁₇ C ₈ H ₁₇ H Pt 1 1 Pi FL2 C ₈ H ₁₇ C ₈ H ₁₇ H Pt 1 1 Pi FL2 C ₈ H ₁₇ C ₈ H ₁₇ H Pt 1 1 Pi FL2 C ₈ H ₁₇ C ₈ H ₁₇ H Pt 1 Th4 H			R5		R5		R5		R5	ı		ı	ı			ı	
Table 33 (core of the core of		CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	CH ₃	I	I	I	I
M m n CyN1 CyC1 R R" R	ontinued)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	I
M m n CyN1 CyC1 R R" R	ble 33 (co	ù		<u>"</u>		ù		<u></u>		C ₄ H ₉	ı	ı	ı	C ₈ H ₁₇	1	ı	
C C C C C C C C C C C C C C C C C C C	Та	2		"		2		<u>"</u>		C ₄ H ₉	-	ı	ı	C ₈ H ₁₇	-	-	1
E		CyC1				CyC2				FL2		Tn3		FL2		Tn4	
E		CyN1				CyN2				Pi		Pi		Pi		Pi	
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Table 34

	2		8		22		22	'	'	'	'	I	'	'	'	'	'	'	-	1	'	'	'
	R7		R7		R7		R7	I				I		,	ı	ı		ı	-	ı	•	ı	•
CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	Ŧ	ı		ı	Н	_	-	ı	Н	1	1	•
	R5		R5		R5		R5	ェ				Ξ		,	ı	エ	ı			ェ	ı	1	,
CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		DBT3	I	I	I	Ph2	I	I	I	Tn5	I	Н	н	Np3	I	I	I
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
œ		<u>"</u>		ùΥ		<u>.</u>		CH ₃				CH ₃		CH ₃	ı	C ₃ H ₇	•	CH ₃	ı	CH ₃	•	CH ₃	,
~		į.		œ		ĒΣ		CH ₃				CH3		CH ₃		C ₃ H ₇	-	CH ₃	-	CH ₃		CH ₃	1
CyC1				CyC2				FL2	l	FL1		FL2		FL2		FL2		FL2		FL2		FL2	
CyN1				CyN2				<u>P</u>		Ē		ā		<u>i</u>		Ы		Ы		<u>a</u>		ЫĞ	
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8								441				442				443				444			

Table 34 (continued)

		88 88		88		88		R8	ı	ı	ı	ı	ı	ı	ı		I	-	ı	ı	I	ı		
		R7		R7		R7		R7	ı	1		-	I		ı		I	-			т		-	-
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	ı	ı	1	ı	I	ı	ı	1	I	ı	1	ı	OCH ₂ C ₅ F ₁₁	1	1	
		R5		R5		R5		R5	ı	1		-	I		ı		I	-		ı	т		-	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		Н	I	I	Н	FL5	Н	т	I	Ph2	Н	I	Н	Ph2	Н	Н	I
nea)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		Н	н	н	I	н	I	т	н	Н	Н	н	Ph3	Н	Н	Н	т
lable 34 (continued)	ĬΥ		"		ά		<u>"</u> х		C ₈ H ₁₇	1	(CH ₂) ₅ Ph3	ı	C ₂ H ₅	C_2H_5	1	1	CH ₃	•	ı	1	CH ₃	-	-	1
<u>a</u>	œ		<u>"</u>		œ		Ţ.		C ₈ H ₁₇	ı	(CH ₂) ₅ Ph3	ı	C ₂ H ₅	C ₂ H ₅	ı	ı	CH ₃	-	ı	ı	CH ₃	1	1	ı
	CyC1				CyC2				FL2	1	FL2		FL2		Qn2		FL2		CZ		FL2		Ph1	
	CyN1				CyN2				<u>a</u>		Pi		Pi		Pr		<u>a</u>		Pr		Pi		Ā	
	С								-				-				-				1			
	Ε								-				-				-				1			
	Σ								Ŧ				Ŧ				Ŧ				Pt			
	8								445				446				447				448			

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Table 34 (continued)

		R8		R8		R8		R8	I	-	-		-	Н	-	-
		R7		R7		R7		R7	I	1	-	ı	I	I	-	
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	OC≡C-C ₇ H ₁₅	ı	ı	ı	Ph3	Н	ı	ı
		R5		R5		R5		R5	I		-		ェ	т	-	
	CyN1-R2	1	CyC1-R4		CyN2-R2		CyC2-R4		Ph2	I	н	I	FL5	Ph2	Н	I
nea)	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	Н	н	I	Н	Н	CH ₃
lable 34 (continued)	čΥ		Х		ά		'A		CH ₃			1	CH ₃	CH ₃		-
<u> </u>	œ		<u>"</u>		œ		<u>"</u>		CH ₃	ı		ı	CH ₃	СН3	-	ı
	CyC1				CyC2				FL2		Ph1		FL2		Ph1	
	CyN1				CyN2				Ε		Py2		Pi		Pi	
	С								_				-			
	Ε								_				_			
	Σ								F				Pt			
	8								449				450			

Table 35

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	R8		R8		R8		R8				:					I							
5	R7	2	R7	2	R7	22	R7	I				I				I					I	ı	
CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I				I				FL4				,	I	ı	,
	R5		R5		R5	1	R5	ェ				I				ェ		,			I	ı	
CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL4	I	I	I	FL4	ェ	I	I	Ph2	I	ェ	I	I	I	I	н
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	I	I	I	I	I	I	I	I	I	I	FL4	I	I
œ		<u>"</u>		ùΥ		<u></u>														1		ı	
œ		<u>"</u>		œ		ŗ.				1										ı		ı	
CyC1				CyC2				Ph1	I	Ph1		Np2		Ph1	ı	FL1	I	Ph1		Ph1		Ph1	
CyN1				CyN2				Pi		Ε		Ē		Ε		Ρi		Ρi		Pi		Pi	
_								-				_				_				-			
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^o Z								451				452				453				454			

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Table 35 (continued)

		R8		R8		R8		R8	I	-		ı		ı	ı	-	ı	-	ı		•	-	ı	1
	7	R7	2	R7	CyN2	R7	CyC2	R7	I						ı			1					ı	-
	CyN1	R6	CyC1	R6	Š	R6	Š	R6	FL4		-	ı		ı	ı	-	ı	1	-			-	ı	-
		R5		R5		R5		R5	I	-	-	ı	ı	ı	ı	-	ı	-	-	ı	-	-	ı	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		Ph2	н	н	н	н	Н	н	Н	н	Н	Н	I	Н	Н	Н	Н
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	н	I	I	I	I	н	н	I	н	н	I	н	н	Н	н
continued)	Ľ		''		čΥ		<u>"</u>		ı	ı		ı	Ph3	ı	ı	ı	Ph3	ı	-	ı	(CH ₂) ₅ Ph3		ı	ı
lable 35	œ		"Α		œ		<u>"</u>		ı	ı		ı	Ph3	ı	ı	ı	CH ₃		ı	ı	(CH ₂) ₅ Ph3	ı	ı	ı
	CyC1				CyC2				Ph1	1	Ph1		FL2		Ph1		FL2	1	Ph1	•	FL2		Ph1	
	CyN1				CyN2				Pi		<u>P</u>		Pi		Pi		Pi		Ρi		Pi		<u>F</u>	
	ч								_				_				_				1			
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	°Z								455				456				457				458			

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	i		1		1											
	F	R7	2	R7	CyN2	R7	CyC2	R7	I		-		I	ı	ı	-
	CyN1	R6	CyC1	R6	S	R6	Š	R6	I		-	-	н			-
		R5		R5		R5		R5	I			ı	I	ı	ı	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	т	FL5	I	Н	Н
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		н	н	Н	Н	Н	Н	Н	CI
Table 35 (continued)	ĬΣ		Т.		ά		 Т.		I	CH ₃	-	ı	CH ₃	CH ₃		-
Table 3	œ		<u>"</u>		~		<u>"</u>		I	CH ₃	-		CH ₃	CH ₃	•	-
	CyC1				CyC2				FL2	ı	Ph1		FL2		Ph1	
	CyN1				CyN2				ï		Pi		Ē		ï	
	С								-				-			
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	9 2								459				460			

Table 36

	R8		R8		R8		R8			ı								ı		ı	ı	ı	ı
5	R7	2	R7	72	R7	22	R7	I		,		I			,	I		,		I			,
CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	Ph3	I			I				I				I		-	,
	R5		R5		R5	1	R5	ェ	I	,		I				ェ		,		I	ı		,
CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Tn8	I	ェ	FL5	I	I	I	FL5	ェ	I	I	FL5	I	Н	ェ
CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	Br	I	I	I	CF ₃	I	I	I	C ₅ H ₁₁	Н	I	Н	ОСН3
œ		R."		ά		 Т.		CH ₃	CH ₃				CH ₃		1		Ph3		1	ı	Ph3	-	
œ		<u>"</u>		œ		<u>r</u>		CH ₃	CH3	ı		1	CH3	ı	ı		Ph3	ı	ı	ı	Ph3	1	1
CyC1				CyC2				FL2		Ph1		Ph1		Ph1		Ph1	I	Ph1		Np2		Ph1	
CyN1				CyN2				Ē		Ē		Ē		Ē		Ē		Ē		Pi		Pi	
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Σ								Ŧ				ᇁ				Ŧ				Ŧ			
^o Z								461				462				463				464			

		R8		R8		R8		R8	Н	-	1	-	-		-	-	-	-	ı	-	-	-	-	-
	2	R7	2	R7	CyN2	R7	CyC2	R7	Н	-	ı	-	Н	ı	-	-	Н	-	ı	-	Н	-	-	-
	CyN1	R6	CyC1	R6	ਠੋ	R6	Š	R6	FL5	-			I	-	-	-	Н	-			Н	-	-	-
		R5		R5		R5		R5	I	-	ı		I	ı	-	-	I	-		ı	Н	-	-	-
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		Ph2	I	I	I	FL5	I	н	I	FL5	Н	I	I	FL5	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	Н	I	Ö	I	I	н	I	I	Н	I	I	Н	I	н	I
3 (continued)	Ľ		Α""		ĒΣ		<u>т</u>		CH ₃	CH_3	ı		I	CH_3	-	-	CH ₃	CH_3	ı	ı	$C_{15}H_{31}$	$C_{15}H_{31}$	-	-
Table 36	ď		"A		œ		<u>"</u>		CH ₃	CH ₃	ı	,	I	CH ₃	-	•	CH ₃	CH ₃	1	ı	C ₁₅ H ₃₁	C ₁₅ H ₃₁	-	-
	CyC1				CyC2				FL2		Ph1		FL2		Np1		FL2		Np2		FL2		Pe1	
	CyN1				CyN2				Ξ		Ξ		Ē		Pi		Ы		Ξ		Pi		Pi	
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	٤								_				-				_				_			
	Σ								Pŧ				Pd				Pd				рА			
	8 N								465				466				467				468			

	F	꼾	12	R.	CyN2	\ <u>\</u>	CyC2	8	エ	1	'	1	I	1	1	'
	CyN1	R6	CyC1	R6	Cyl	R6	Š	R6	I	1		ı	I	1	-	-
		R5		RS		R5		R5	I	1	-		I	-	-	1
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	Н	Н	-	FL5	Н	Н	-
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		т	I	I	I	I	н	I	Н
Table 36 (continued)	Ľ		R."		Ŋ.		Т.		Ph3	Ph3	1	1	(CH ₂) ₅ Ph3	CH ₃	1	1
Table 3	α.		R"		Υ.		<u>"</u>		CH ₃	CH ₃	1	1	(CH ₂) ₅ Ph3	CH ₃	1	1
	CyC1				CyC2				FL2		Cn1		FL2		Cn2	
	CyN1				CyN2				Ē		Pi		Ē		Pi	
	u								-				1			
	ш								-				1			
	M								Pd				Pd			
	No								469				470			

		R8		R8		R8		R8	1	ı	ı	ı	ı	1	ı	ı	ı	ı	ı	1	ı	ı	ı	1
	Z 1	R7	2	R7	CyN2	R7	CyC2	R7	1	-	ı	-	-	1	-	-		ı	ı	1	Н	ı	-	•
	CyN1	R6	CyC1	R6	Cy	R6	Cy	R6	-	-	-	-	-		-	-	-		-	-	Н		-	-
		R5		R5		R5		R5	1		ı	-		1	-	1	-	,	1	1	I	1	-	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		I	I	I	I	I	I	I	Т	Н	I	I	I	FL5	I	Н	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		н	Н	н	Н	н	н	Н	Н	Н	I	Н	н	Н	т	Н	т
Table 37	Ą.		<u>"</u>		Ā		R		Ph3	1	C ₃ H ₇	1	Ph3	1	1	1	(CH ₂) ₅ Ph3	ı	1	1	Н	CH ₃	-	
L	Ж		<u>"</u>		æ		R"		Ph3	ı	C ₃ H ₇	ı	CH ₃	1	1	ı	(CH ₂) ₅ Rh3	ı	ı		Н	CH ₃	1	1
	CyC1				CyC2				FL2		FL2		FL2		FL3		FL2		DBF1		FL2		DBT1	
	CyN1				CyN2				Ξ		Ē		Ε		Pi		ï		ï		Ξ		Pi	
	u								~				-				_				_			
	ш								~				_				_				_			
	Μ								Pq				Pd				Pd				Pd			
	οN								471				472				473				474			

Table 37 (continued)

		R8		88		R8		R8	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı		ı	ı	
	_	R7	_	R7	2	R7	7	R7	ェ	1	1	ı	ェ	ı	ı		ェ	-	ı	ı	エ	ı		
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	エ	ı	1	ı	Ph3	ェ	ı	1	I	-	ı	ı	I		-	
		R5		R5		R5		R5	ェ	1	ı	ı	ェ	ェ	ı	ı	ェ	-	ı	ı	ェ	ı		
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	FL5	Tn8	I	I	FL5	I	I	I	FL5	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	Ö	I	Н	I	Br	Н	Н	Н	CF ₃	Н	Н	Н	C ₅ H ₁₁
(continued)	ĬΥ		R		Ϋ́		 "		CH ₃	CH ₃	1	ı	CH ₃	CH ₃	1	1	-	CH_3	1	ı	-	Ph3	-	1
lable 37	œ		π."		~		<u>"</u>		CH ₃	CH ₃	1	ı	CH ₃	CH ₃	ı	1	1	CH ₃	1	ı	-	Ph3	-	
-	CyC1				CyC2				FL2		Qn1		FL2		Ph1		Ph1		Ph1		Ph1		Ph1	
	CyN1				CyN2				<u>a</u>		Pi		<u>a</u>		Pi		Pi		Pi		Pi		Pi	
	_								-				-				-				-			
	Ε								-				-				_				1			
	Σ								Pd				Pd				Pd				рА			
	8								475				476				477				478			

	5	2	5	<u>~</u>	2	<u>~</u>	22	2	🛨	'	'	'	_	'	'	ļ '
	CyN1	R6	CyC1	R6	CyN2	R6	CyC2	R6	I	ı	ı	ı	FL5	ı	ı	
		R5		R5		R5		R5	I		ı	ı	I	ı	ı	
	CyN1-R2		CyC1-R4		CyN2-R2		CyC2-R4		FL5	I	I	I	Ph2	I	I	I
	CyN1-R1		CyC1-R3		CyN2-R1		CyC2-R3		I	I	I	осн	I	I	I	ō
Table 37 (continued)	ĭΥ		Т.		žΥ		<u>"</u>		ı	Ph3		ı	CH ₃	CH ₃		
Table 37	~		<u>"</u>		œ		<u>"</u>		ı	Ph3	ı	ı	CH ₃	CH ₃	ı	
	CyC1				CyC2				Np2		Ph1		FL2		Ph1	l
	CyN1				CyN2				Ε		Ρi		<u>i</u>		Ε	
	u								-				-			
	ш								_				-			
	Σ								Pd				Pd			
	9V								479				480			

Table 38

5 481 Ir 482 Ir 15 483 Ir 484 Ir 20 485 Ir	3 3 3 3	0 0 0	Pi Pi Pi	FL1 FL1	R"	R""	CyC1-R3 H -CH=CH-		R5 R5 -	R6 Cyc R6 -	R7 C1 R7 -	R8 R8
10 482 Ir 15 483 Ir 484 Ir	3 3 3	0	Pi Pi	FL1			H -CH=CH-	H -CH=CH-	-	R6	R7	
10 482 Ir 15 483 Ir 484 Ir	3 3 3	0	Pi Pi	FL1		-	-CH=CH-	-CH=CH-	-	-	-	
10 482 Ir 15 483 Ir 484 Ir	3 3 3	0	Pi Pi	FL1		-	-CH=CH-	-CH=CH-				-
482 Ir 483 Ir 484 Ir	3	0	Pi		-	-			-	_		
483 Ir 484 Ir	3	0	Pi		-		Н				_	-
484 Ir	3			FL1		_		CF ₃	-	-	-	-
484 Ir	3			FL1	_	-	-CH=CH-	-CH=CH-	ı	-	-	-
20		0	Pi		-	-	Н	FL4	Η	Н	Н	-
20		0	Pi		-	-	-CH=CH-	-CH=CH-	-	-	-	-
20 485 Ir	3			FL1	-	-	Н	Ph2	Ι	Н	Н	Н
485 Ir	3				-	-	-CH=CH-	-CH=CH-	ı	-	-	-
		0	Pi	FL1	-	-	Н	FL4	Н	Ph3	I	-
	1				-	-	-CH=CH-	-CH=CH-	Н	Н	Н	Н
486 Ir	3	0	Pi	FL1	-	-	Н	Np4	Н	-	-	-
25					-	-	-CH=CH-	-CH=CH-	-	-	-	-
487 Ir	3	0	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	-	-	-	-
488 Ir	3	0	Pi	FL2	CH ₃	CH ₃	Н	CF ₃	-	-	-	-
30					-	-	-CH=CH-	-CH=CH-	-	-	-	-
489 Ir	3	0	Pi	FL2	CH ₃	CH ₃	CF ₃	CF ₃	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	-	-	-	-
35 490 Ir	3	0	Pi	FL2	CH ₃	CH ₃	Н	CH ₃	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	ı	-	1	-
491 Ir	3	0	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
40					-	-	-CH=CH-	-CH=CH-	-	-	-	-
492 Ir	3	0	Pi	FL2	C_2H_5	C ₂ H ₅	Н	Н	-	-	1	-
					-	-	-CH=CH-	-CH=CH-	-	-		-
493 Ir	3	0	Pi	FL2	C_3H_7	C ₃ H ₇	Н	H	ı	-	-	-
45					-	-	-CH=CH-	-CH=CH-	1	-	1	-
494 Ir	3	0	Pi	FL2	C ₄ H ₉	C ₄ H ₉	Н	Н	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	-	-	-	-
495 Ir	3	0	Pi	FL2	Ph3	Ph3	Н	Н	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	-	-	-	-
496 Ir	3	0	Pi	FL2	CH ₃	Ph3	Н	Н	-	-	-	-
					-	-	-CH=CH-	-CH=CH-	-	-	-	-
⁵⁵ 497 Ir	3	0	Pi	FL2	Н	Н	Н	FL5	Н	Н	Н	-
					CH ₃	CH ₃		-CH=CH-	_	_	_	-

Table 38 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Су	N1	
											R5	R6	R7	R8
5							R"	R'''	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
	498	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	I	Н	Н	-
10							CH ₃	CH ₃	-CH=CH	-CH=CH-	-	-	-	-
	499	lr	3	0	Pi	FL2	C_2H_5	C_2H_5	Н	FL5	I	Н	Н	-
							C ₂ H ₅	C ₂ H ₅	-CH=CH	-CH=CH-	-	-	-	-
4.5	500	lr	3	0	Pi	FL2	C ₅ H ₁₁	C ₅ H ₁₁	Н	FL5	I	Н	Н	-
15							C ₅ H ₁₁	C ₅ H ₁₁	-CH=CH	-CH=CH-	-	-	-	-
	501	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	FL5	I	Н	Н	-
							C ₈ H ₁₇	C ₈ H ₁₇	-CH=CH	-CH=CH-	-	-	-	-
20	502	lr	3	0	Pi	FL2	CH ₃	CH ₃	Н	Ph2	Н	Н	Н	Н
							-	-	-CH=CH	-CH=CH-	-	-	-	-

		R8		R8	I	-	I		I	-	ı	-	ı	-				-	ı	-
		R7		R7	I		I	ı	I			-	ı			ı	1			1
	CyN1	R6	CyC1	R6	I	ı	OCH ₂ C ₅ F ₁₁	ı	OC≡C-C ₇ H ₁₅	1	I	1	I	ı	I	ı	1	1	I	1
		R5		R5	CF ₃		I	ı	I		I	-	I		I	ı	I		I	1
	CyN1-R2		CyC1-R4		Ph2	-СН=СН-СН=СН-	Ph2	-CH=CH-	Ph2	-СН=СН-СН=СН-	Tn5	-СН=СН-СН=СН-	Tn6	-CH=CH-	Np3	-СН=СН-СН=СН-	Np4	-CH=CH-	Tn7	-CH=CH-
939	CyN1-R1		CyC1-R3		I	-CH=CH	I	-СН=СН-СН=СН-	I	-CH=CH	I	-CH=CH-	I	-СН=СН-СН=СН-	I	-CH=CH-	I	-СН=СН-СН=СН-	I	-СН=СН-СН=СН-
Table 39	Ī.		<u>"</u>		СН3		СН3	ı	СН3		C ₃ H ₇		СН3		СН3	ı	СН3		СН3	
	œ		<u></u>		СН3		СН3	ı	СН3		C ₃ H ₇	-	СН3		СН3	ı	СН3		СН3	
	CyC1				FL2		FL2		FL2		FL2		FL2		FL2		FL2		FL2	
	CyN1				ä		Ē		ä		ä		ä		ā		Ē		ä	
	С				0		0		0		0		0		0		0		0	
	٤				က		3		3		က		က		3		3		က	
	Σ				느		<u>-</u>				<u>-</u>		느		ے		느		<u>-</u>	
	_o N				503		504		202		909		202		208		209		510	

Table 40

								Table 10						
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		CyN	N 1	
5											R5	R6	R7	R8
							R"	R"'	CyC1-R3	CyC1-R4		CyC	C1	
											R5	R6	R7	R8
					E		R"	R"'				Е		
10											R5	R6	R7	R8
					C	3	R"	R"'				G		
											R5	R6	R7	R8
15	511	lr	2	1	Pi	FL1	-	-	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
					C	H ₃	-	-			-	-	-	-
20					C	H ₃	-	-			-	-	-	-
20	512	lr	2	1	Pi	FL1	-	-	Н	CF ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-
					С	F ₃	-	-			-	-	-	-
25					С	F ₃	-	-			-	-	-	-
	513	lr	2	1	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
30					C	H ₃	-	-			-	-	-	-
00					C	H ₃	-	-			-	-	-	-
	514	lr	2	1	Pi	FL2	CH ₃	CH ₃	Н	CF ₃	•	-	-	-
							-	-	Н	Н	-	-	-	-
35					Pl	12	-	-			Н	Н	Н	Н
					Pl	12	-	-			Н	Н	Н	Н
	515	lr	2	1	Pi	FL2	CH ₃	CH ₃	Н	Н	-	-	-	-
40							-	-	Н	OC ₄ H ₉	•	-	-	-
						ո2	-	-			Н	C ₃ H ₇	Н	Н
					Pl	12	-	-			Н	C ₃ H ₇	Н	Н
	516	lr	2	1	Pi	FL2	C ₆ H ₁₃	C ₆ H ₁₃	Н	Н	•	-	-	-
45							-	-	Н	Н	-	-	-	-
						H_3	-	-			Н	Н	-	-
					FI	_5	CH ₃	CH ₃			Н	Н	Н	_
50	517	lr	2	1	Pi	FL2	Н	Н	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	ı	-	-	-
					Tı	า5	-	-			Н	Н	-	-
					Tı	า5	-	-			Н	Н	-	-

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Table 40 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N 1	
											R5	R6	R7	R8
5							R"	R"'	CyC1-R3	CyC1-R4	•	СуС	C1	
											R5	R6	R7	R8
					E		R"	R'''				E		
10											R5	R6	R7	R8
					(3	R"	R'''				G	i	
											R5	R6	R7	R8
4.5	518	lr	2	1	Pi	FL2	CH ₃	CH ₃	Н	FL5	Н	Н	Н	-
15							CH ₃	CH ₃	Н	Н	-	-	-	-
					Tı	16	-	-			Н	Н	-	-
					Ti	ո6	-	-			Η	Н	-	-
20	519	lr	2	1	Pi	FL2	Ph3	Ph3	Н	FL5	Η	Н	Н	-
							Ph3	Ph3	Н	Н	-	-	-	-
					CI	H_3	-	-			-	-	-	-
25					CI	H_3	-	-			-	-	-	-
25	520	lr	2	1	Pi	FL2	CH ₃	Ph3	Н	FL5	Η	Н	Н	-
							CH ₃	Ph3	Н	Н	1	-	-	-
					С	F ₃	-	-			-	-	-	-
30					С	F ₃	-	-			-	-	-	-

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5			88		88		88		88			ı		I			ı	I	1	ı	
10			R7		R7		R7		R7	I	,			I		1	,	I	1	ı	
15		CyN1	R6	CyC1	R6	ш	R6	ŋ	R6	I		I	I	I	·	ı	ı	OCH ₂ C ₅ F ₁₁	1	1	ı
			R5		R5		R5		R5	I	1	СН3О	CH ₃ O	I		ш	ш	I	ı	CH ₃	CH ₃
20		CyN1-R2		CyC1-R4						FL5	I			Ph2	I			Ph2	I		
25		CyN1-R1		CyC1-R3						I	エ			I	I			I	I		
30	Table 41	ù		<u>.</u>		<u>.</u>		<u>.</u>		(CH ₂) ₅ Ph3	CH ₃	1	1	CH ₃		1	ı	CH ₃	1	1	ı
35		œ		<u>r</u>		<u>r</u>		<u>r</u>		(CH ₂) ₅ Ph3	CH ₃		1	CH ₃		ı		CH ₃			1
40		CyC1						_		FL2		3	2	FL2	•	4	4	FL2		7	7
		CyN1				Ш		ŋ		ā		Np3	Np3	ā		Np4	Np4	Ē		Tn7	Tn7
45		٦								-			1	-		1		~			
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5																									
			R8		R8		R8		R8	ı					I	ı		ı	I	I	I		ı	ı	
10			R7		R7		R7		R7	ı	1	-	ı	I	I	ı	1	I	I	I	I	I	ı	I	I
15		CyN1	R6	CyC1	R6	ш	R6	Ŋ	R6	ェ	ı	ı		Ph3	I	ェ	I	Ph3	I	CH_3	CH ₃	I	ı	I	I
			R5		R5		R5		R5	I	ı	I	I	I	I	I	I	I	I	СН3	CH ₃	I	ı	I	I
20		CyN1-R2		CyC1-R4						Tn5	I			FL4	Ph2		ı	FL5	Ph2		1	FL5	I		
25	inued)	CyN1-R1		CyC1-R3						I	I			I	I			I	I			I	I		
30	Table 41 (continued)	ĭΥ		<u>"</u> "		<u>"</u>		<u>"</u>		C ₃ H ₇	1	1	ı	CH ₃	ı		1	CH ₃	CH ₃	ı	1	1	CH ₃	1	
35	12	œ		<u>r</u>		Ţ.		Ē.		C ₃ H ₇	ı		ı	CH ₃	ı	ı	ı	CH ₃	CH ₃	ı	ı	ı	CH ₃	ı	
40		CyC1								FL2		8	2	FL2		01	01	FL2					Ph1	4	4
		CyN1				Ш		ŋ		ä		Pe2	Pe2	ï		Pi2	Pi2	ä		Pi3	Pi3		ï	FL4	FL4
45		_								~				-				~				~			
		٤								7				2				7				2			
50		Σ								느				ı				느				ı			
		ž								525				526				527				528			

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5													
			R8		R8		R8		R8	I		ı	ı
10			R7		R7		R7		R7	I	ı	Н	I
15		CyN1	R6	CyC1	R6	ш	R6	9	R6	FL5	-	Н	Н
			R5		R5		R5	_	R5	I	1	I	I
20		CyN1-R2		CyC1-R4						Ph2	I		
25	inued)	CyN1-R1		CyC1-R3						I	I		•
30	Table 41 (continued)	ùΥ		<u>"</u> "		<u>"</u> "		<u>"</u> "		CH ₃	CH ₃	C_2H_5	(CH ₂) ₅ Ph3
35	-	œ		ŗ.		ŗ.		ĬZ.		CH ₃	CH ₃	C ₂ H ₅	(CH ₂) ₅ Ph3
40		CyC1								FL2		.5	.5
		CyN1				Ш		ŋ		Ë		FL5	FL5
45		_								_			
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Table 42

								Table 42						
	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N1	
											R5	R6	R7	R8
							R"	R'"	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					I	Ē	R"	R'"				Е		
)											R5	R6	R7	R8
					(G	R"	R'''				G	}	
											R5	R6	R7	R8
5	531	lr	2	1	Pi	Ph1	-	-	Н	Ph2	Н	FL5	Н	Н
							CH ₃	CH ₃	Н	Н	-	-	-	-
					DE	3T3	-	-			Н	Н	Н	-
					DE	3T3	-	-			Н	Н	Н	-
)	532	Rh	2	1	Pi	FL3	CH ₃	CH ₃	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
					С	H ₃	-	-			-	-	-	-
i					С	H ₃	-	-			-	-	-	-
	533	Rh	2	1	Pi	DBF1	CH ₃	CH ₃	CF ₃	CF ₃	-	-	-	-
							-	-	Н	Н	-	-	-	-
					С	F ₃	-	-			-	-	-	-
					С	F ₃	-	-			-	-	-	-
	534	Rh	2	1	Pi	FL1	-	-	Н	FL5	Н	Н	Н	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
					Q	n2	-	-			Н	Н	-	-
					Q	n2	-	-			Н	Н	-	-
	535	Rh	2	1	Pi	Np2	-	-	Н	FL4	Н	Н	Н	-
)							-	-	Н	Н	-	-	-	-
					N	р3	-	-			Н	Н	-	-
					N	р3	-	-			Н	Н	-	-
	536	Pt	1	1	Pi	FL2	C ₃ H ₇	C ₃ H ₇	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
					С	H ₃	-	-		•	-	-	-	-
					С	H ₃	-	-	1		-	-	-	_
)	537	Pt	1	1	Pi	FL2	C ₅ H ₁₁	C ₅ H ₁₁	Н	Н	-	-	-	-
							-	-	Н	Н	-	-	-	-
					С	F ₃	-	-		•	-	-	-	-
			1	ı		F3			1					+

Table 42 (continued)

	No	М	m	n	CyN1	CyC1	R	R'	CyN1-R1	CyN1-R2		Cyl	N 1	
											R5	R6	R7	R8
5							R"	R'"	CyC1-R3	CyC1-R4		Су	C1	
											R5	R6	R7	R8
					E	=	R"	R'"				E		
10											R5	R6	R7	R8
					(3	R"	R"				G	;	
											R5	R6	R7	R8
15	538	Pd	1	1	Pi	FL2	C ₁₅ H ₃₁	C ₁₅ H ₃₁	Н	FL5	Η	Н	Η	-
15							C ₁₅ H ₃₁	C ₁₅ H ₃₁	Н	Н	-	-	•	-
					CI	H ₃	-	-			-	-	-	-
					CI	H_3	1	1			1	-	1	_
20	539	Pd	1	1	Pi	FL2	CH ₃	CH ₃	Н	Np3	Н	Н	-	-
							-	-	Н	Н	-	-	-	-
					C	F ₃	-	-			-	-	-	-
25					C	F ₃	-	-			-	-	-	-
20	540	Ir	1	2	Pi	Tn4	-	-	Н	FL5	Н	Н	Η	-
							CH ₃	CH ₃	Н	Н	-	-	-	-
					CI	H ₃	-	-			-	-	ı	-
30					CI	H_3	-	-			-	-	•	-

[0063] Hereinbelow, the present invention will be described more specifically based on Examples.

Example 1 (Synthesis of Example Compound No. 23)

[0064]

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[0065] In a 30 liter-three-necked flask, 307.3 g (960 mM) of 2-iodo-9,9-dimethylfluorene and 10 liters of dry THF (tetrahydrofuran) were placed and cooled to -72 to 70 °C under stirring in an argon gas stream atmosphere. To the mixture, a 1.6M solution of n-butyllithium in hexane was added dropwise in 1 hour, followed by further stirring for 2 hours at the temperature. Thereafter, under stirring at -73 to -71 °C, to the system, a solution of 209.5 g (2016 mM) of trimethyl borate in 1.3 liters of dry THT was added dropwise in 2 hours. The reaction mixture was left standing overnight on an ice water bath. To the mixture, 1.6 liters of 4N-hydrochloric acid was added in 0.5 hour at 0 - 7 °C, followed by stirring for 1 hour at room temperature and extraction with toluene. The organic layer was washed with saturated saline water, followed by distilling-off of the solvent under a reduced pressure to obtain a residue. To the residue, hexane was added and heated under heating, followed by cooling to precipitate a crystal. The crystal was recovered by filtration and purified by silica gel column chromatography (eluent: toluene/ethyl acetate = 1/1), followed by successive recrystallization from a chloroform-hexane mixture solvent, toluene, an ethyl acetate-toluene-THF mixture solvent, and tol-

uene to obtain 32.0 g of 2-(9,9-dimethylfluorenyl)boronic acid (colorless crystal) (Yield: 14.0 %).

$$H_3C$$
 CH_3 Br H_3C CH_3 N

[0066] In a 300 ml-three-necked flask, $8.5 \, \mathrm{g}$ (53.8 mM) of 2-bromopyridine, $12.8 \, \mathrm{g}$ (53.8 mM) of 2-(9,9-dimethylfluorenyl)boronic acid, $55 \, \mathrm{ml}$ of toluene, $27 \, \mathrm{ml}$ of ethanol and $55 \, \mathrm{ml}$ of 2M-sodium carbonate aqueous solution were placed and stirred at room temperature under nitrogen stream, and $1.97 \, \mathrm{g}$ (1.70 mM) of tetrakis(triphenylphosphine) palladium (0) was added thereto. Thereafter, reflux under stirring for $5.5 \, \mathrm{hours}$ was performed under nitrogen stream. After the reaction, the reaction mixture was cooled and extracted by addition of cold water and toluene. The organic layer was washed with water until neutrality, and the solvent was removed under reduced pressure to obtain a residue. The residue was successively purified by silica gel column chromatography (eluent: toluene/THF = 10/1) and that (eluent: hexane/ethyl acetate = 8/1) to obtain $12.2 \, \mathrm{g}$ of $2-\{2-(9,9-\mathrm{dimethylfluorenyl})\}$ pyridine (pale brown viscous liquid) (Yield: $83.6 \, \%$).

[0067] In a 100 ml-four-necked flask, 50 ml of glycerol was placed and heated at 130 - 140 °C under stirring and bubbling with nitrogen for 2 hours. Then, the glycerol was cooled by standing down to 100 °C, and 1.69 g (6.23 mM) of 2-{2-(9,9-dimethylfluorenyl)}pyridine and 0.50 g (1.02 mM) of iridium (III) acetylacetonate were added, followed by 5 hours of heating at 176 - 219 °C under stirring and nitrogen stream. The reaction product was cooled to room temperature and injected into 300 ml of 1N-hydrochloric acid to form a precipitate, which was filtered out and washed with water, followed by drying for 5 hours at 100 °C under reduced pressure. The precipitate was purified by silica gel column chromatography with chloroform as the eluent to obtain 0.17 g (yield = 21.3 %) of orange powdery tris[2-(9,9-dimethylfluorene-2-yl)pyridine-C³,N]iridium (III). According to MALDI-TOF MS (matrix-assisted laser desorption ionization-time of fight mass spectroscopy), the compound exhibited M+ (mass number of the corresponding cation formed by removal of 1 electron) of 1003.4.

[0068] A toluene solution of the compound exhibited a photoluminescence spectrum showing λ max (maximum emission wavelength) = 545 nm and a quantum yield of 0.23.

[0069] The compound (Ex. Comp. No. 23) exhibited better synthesis yield and quantum yield, thus being most suitable luminescence material in the present invention.

Example 2 (Synthesis of Example Compound No. 43)

[0070]

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[0071] In a 100 ml-three-necked flask, 1.18 g (4.98 mM) of 2,5-dibromopyridine, 3.57 g (15.0 mM) 2-(9,9-dimethyl-

fluorenyl)boronic acid prepared in Example 1, 10 ml of toluene, 5 ml of ethanol and 10 ml of 2M-sodium carbonate aqueous solution were placed and stirred at room temperature under nitrogen stream, and 0.35 g (0.30 mM) of tetrakis (triphenylphosphine)-palladium (0) was added thereto. Thereafter, reflux under stirring was performed for 12 hours under nitrogen stream. After completion of the reaction, the reaction product was cooled on an ice bath to precipitate a crystal, which was then filtered out and washed with water. To the crystal, 100 ml of methanol was added and washed at room temperature under stirring, and then was recovered by filtration. The resultant crystal was purified by silica gel column chromatography (eluent: chloroform) to obtain 2.10 g (yield = 91.0 %) of 2,5-bis{2-(9,9-dimethylfluorenyl)} pyridine (colorless crystal).

[0072] In a 100 ml-four-necked flask, 50 ml of glycerol was placed and heated at 130 - 140 $^{\circ}$ C under stirring and bubbling with nitrogen for 2 hours. Then, the glycerol was cooled by standing down to 100 $^{\circ}$ C, and 1.85 g (3.99 mM) of 2,5-bis{2-(9,9-dimethylfluorenyl)}pyridine and 0.40 g (0.82 mM) of iridium (III) acetylacetonate were added, followed by 5 hours of reflux at 180 - 235 $^{\circ}$ C under stirring and nitrogen stream. The reaction product was cooled to room temperature and injected into 300 ml of 1N-hydrochloric acid to form a precipitate, which was filtered out and washed with water, followed by drying for 5 hours at 100 $^{\circ}$ C under reduced pressure. The precipitate was purified by silica gel column chromatography with chloroform as the eluent and recrystallized from a chloroform-methanol mixture solvent to obtain 0.10 g (yield = 7.7 %) of red powdery tris[2,5-bis(9,9-dimethylfluorene-2-yl)pyridine-C³,N]iridium (III). According to MALDI-TOF MS, the compound exhibited M⁺ of 1589.6.

[0073] A toluene solution of the compound exhibited a photoluminescence spectrum showing λ max = 591 nm and a quantum yield of 0.12.

Examples 3 - 11

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[0074] Each of luminescence devices having a layer structure shown in Figure 1B were prepared in the following manner.

[0075] On a 1.1 mm-thick glass substrate (transparent substrate 15), a 100 nm-thick film (transparent electrode 14) of ITO (indium tin oxide) was formed by sputtering, followed by patterning to form a stripe electrode including 100 lines each having a width of 100 nm and a spacing with an adjacent line of 10 nm (i.e., electrode pitch of 110 nm).

[0076] On the ITO-formed substrate, three organic layers and two metal electrode layers shown below were successively formed by vacuum (vapor) deposition using resistance heating in a vacuum chamber (10⁻⁴ Pa).

Organic layer 1 (hole transport layer 13) (40 nm): α -NPD

Organic layer 2 (luminescence layer 12) (30 nm): co-deposited film of CBP:metal complex (metal coordination compound shown in Table 45) (95:5 by weight)

Organic layer 3 (electron transport layer 16) (30 nm): Alq3

Metal electrode layer 1 (metal electrode 11) (15 nm): Al-Li alloy (Li = 1.8 wt. %)

Metal electrode layer 2 (metal electrode 11) (100 nm): Al

[0077] The above-deposited metal electrode layers 1 and 2 (Al-Li layer and Al layer) had a stripe electrode pattern including 100 lines each having a width of 100 nm and a spacing of 10 nm (electrode pitch = 110 nm) and arranged so that the stripe electrode pattern intersected with that of the ITO electrode at right angles to form a matrix of pixels each having an effective electrode area of 3 mm² comprising 20 ITO lines bundled together at a lead-out portion and

15 Al (Al-Li) lines bundled together at a lead-out portion.

[0078] Each of the thus-prepared luminescence devices was taken out of the vacuum chamber and was subjected to a continuous energization (current passage) test in an atmosphere of dry nitrogen gas stream so as to remove device deterioration factors, such as oxygen and moisture (water content).

[0079] The continuous energization test was performed by continuously applying a voltage at a constant current density of 70 mA/cm² to the luminescence device having the ITO (transparent) electrode (as an anode) and the Al (metal) electrode (as a cathode), followed by measurement of emission luminance (brightness) with time so as to determine a time (luminance half-life) required for decreasing an initial luminance (60 - 220 cd/m²) to 1/2 thereof.

[0080] The results are shown in Table 45 appearing hereinafter.

Comparative Example 1

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[0081] A comparative luminescence device was prepared and evaluated in the same manner as in Examples 3 - 11 except that the Ir complexes (metal coordination compounds shown in Table 45) was changed to Ir-phenylpyrimidine complex (Ir(ppy)₃) shown below.

[0082] The results are also also shown in Table 45 below.

Table 45

Ex. No.	Compound No.	Luminance half-life (Hr)
Ex. 3	6	700
Ex. 4	23	850
Ex. 5	43	950
Ex. 6	54	800
Ex. 7	72	850
Ex. 8	99	750
Ex. 9	118	600
Ex.10	153	700
Ex.11	440	650
Comp.Ex. 1	Ir(ppy) ₃	350

[0083] As is apparent from Table 45, compared with the conventional luminescence device using lr(ppy)₃, the luminescence devices using the metal coordination compounds of formula (1) according to the present invention provide longer luminance half-lives, thus resulting in an EL device having a high durability (luminance stability) based on a good stability of the metal coordination compound of formula (1) of the present invention.

Example 12

[0084] A color organic EL display apparatus shown in Figure 2 was prepared in the following manner.

[0085] An active matrix substrate had a planar structure basically similar to a structure described in U.S. Patent No. 6,114,715.

[0086] Specifically, on a 1.1 mm-thick glass substrate, top gate-type TFTs of polycrystalline silicon were formed in an ordinary manner and thereon, a flattening film was formed with contact holes for electrical connection with a pixel electrode (anode) at respective source regions, thus preparing an active matrix substrate with a TFT circuit.

[0087] On the active matrix substrate, a 700 nm-thick pixel electrode (anode) of ITO having a large work function

was formed in a prescribed pattern. On the ITO electrode, prescribed organic layers and a 100 nm-thick Al electrode (cathode) were successively formed by vacuum deposition with a hard mask, followed by patterning to form a matrix of color pixels (128x128 pixels).

[0088] The respective organic layers corresponding to three color pixels (red (R) green (G) and blue (B)) were consisting of the following layers.

<R pixel region>

[0089]

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 α -NPD (40 nm)/CBP: Ex. Comp. No. 487 (93:7 by weight) (30 nm)/BCP (20 nm)/Alq 3 (40 nm)

<G pixel region>

15 [0090]

 α -NPD (50 nm)/Alg 3 (50 nm)

<B pixel region>

[0091]

 α -NPD (50 nm)/BCP (20 nm)/Alq 3 (50 nm)

[0092] When the thus-prepared color organic EL display apparatus was driven, desired color image data can be displayed stably with good image qualities.

Example 13 (Synthesis of Ex. Comp. No. 24)

[0093] It is easy to synthesize the following compound in the same manner as in Example 1 except for using 2-chloro 5-trifluoromethylpyridine (made by Tokyo Kasei Kogyo K.K.) instead of 2-bromopyridine in Example 1.

[0094] Tris[2-(9,9-dimethylfluorene-2-yl)-5-trifluoromethylpyridine-C³,N]iridium (III).

Example 14 (Synthesis of Ex. Comp. No. 25)

[0095] It is easy to synthesize the following compound in the same manner as in Example 1 except for using 2-chloro-4,5-bis(trifluoromethyl)pyridine (made by Oakwood Products Inc.) instead of 2-bromopyridine in Example 1.

[0096] Tris[2-(9,9-dimethylfluorene-2-yl)-4,5-bis(trifluoromethyl)pyridine-C³,N]iridium (III).

40 Example 15 (Synthesis of Ex. Comp. No. 26)

[0097] It is easy to synthesize the following compound in the same manner as in Example 1 except for using 2-chloro-5-methylpyridine (made by Aldrich Co.) instead of 2-bromopyridine in Example 1.

[0098] Tris[2-(9,9-dimethylfluorene-2-yl)-5-methylpyridine-C³,N]iridium (III).

Example 16 (Synthesis of Ex. Comp. No. 28)

[0099] It is easy to synthesize the following compound in the same manner as in Example 1 except that 2-bromo-9,9-diethylfluorene was synthesized from 2-bromofluorene and iodoethane in the same manner as the process described in Example 1 at page 32 of Japanese Laid-Open Patent Application (Tokuhyo Hei) 11-510535 (corr. to U.S. Patent No. 5,708,130) and was modified ito 2-(9,9-diethylfluorenyl)borate in the same manner as in Example 1 (of the present application), followed by reaction with 2-bromopyridine to synthesize 2-{2-(9,9-diethylfluorenyl)pyridine and then reaction with iridium (III) acetylacetonate in the same manner as in Example 1.

[0100] Tris[2-(9,9-diethylfluorene-2-yl)pyridine-C³,N]iridium (III).

Example 17 (Synthesis of Ex. Comp. No. 29)

[0101] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-

dopropane (made by Aldrich Co.) instead of iodoethane in Example 16.

[0102] Tris{2-[9,9-di(1-propyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 18 (Synthesis of Ex. Comp. No. 30)

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[0103] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-dobutane (made by Aldrich Co.) instead of iodoethane in Example 16.

[0104] Tris{2-[9,9-di(1-butyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 19 (Synthesis of Ex. Comp. No. 31)

[0105] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-dopentane (made by Aldrich Co.) instead of iodoethane in Example 16.

[0106] Tris{2-[9,9-di(1-pentyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 20 (Synthesis of Ex. Comp. No. 32)

[0107] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-dohexane (made by Aldrich Co.) instead of iodoethane in Example 16.

20 **[0108]** Tris{2-[9,9-di(1-hexyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 21 (Synthesis of Ex. Comp. No. 33)

[0109] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-doheptane (made by Aldrich Co.) instead of iodoethane in Example 16.

[0110] Tris{2-[9,9-di(1-heptyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 22 (Synthesis of Ex. Comp. No. 34)

30 [0111] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-dooctane (made by Aldrich Co.) instead of iodoethane in Example 16.

[0112] Tris{2-[9,9-di(1-octyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 23 (Synthesis of Ex. Comp. No. 35)

[0113] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-io-dodecane (made by Aldrich Co.) instead of iodoethane and using 2-chloro-5-trifluoromethylpyridine (made by Tokyo Kasei Kogyo K.K.) instead of 2-bromopyridine, in Example 16.

[0114] Tris{2-[9,9-di(1-decyl)fluorene-2-yl]-5-trifluoromethylpyridine-C³,N}iridium (III).

Example 24 (Synthesis of Ex. Comp. No. 37)

[0115] It is easy to synthesize the following compound in the same manner as in Example 16 except for using 1-bro-moeicosane (made by Aldrich Co.) instead of iodoethane in Example 16.

45 **[0116]** Tris{2-[9,9-di(1-eicosyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 25 (Synthesis of Ex. Comp. No. 44)

[0117] It is easy to synthesize the following compound in the same manner as in Example 2 except for using 2-(9,9-diethylfluorenyl)boronic acid instead of 2-(9,9-dimethylfluorenyl)boronic acid in Example 2.

[0118] Tris[2,5-bis(9,9-diethylfluorene-2-yl)pyridine-C³,N]iridium (III).

Example 26 (Synthesis of Ex. Comp. No. 45)

[0119] It is easy to synthesize the following compound in the same manner as in Example 2 except for using 2-[9,9-di (1-pentyl)fluorenyl]boronic acid instead of 2-(9,9-dimethylfluorenyl)boronic acid in Example 2.

[0120] Tris{2,5-bis[9,9-di(1-pentyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 27 (Synthesis of Ex. Comp. No. 47)

[0121] It is easy to synthesize the following compound in the same manner as in Example 2 except for using 2-[9,9-di (1-pentadecyl)fluorenyl]boronic acid instead of 2-(9,9-dimethylfluorenyl)boronic acid in Example 2.

⁵ **[0122]** Tris{2,5-bis[9,9-di(1-pentadecyl)fluorene-2-yl]pyridine-C³,N}iridium (III).

Example 28 (Synthesis of Ex. Comp. No. 146)

[0123] It is easy to synthesize the following compound in the same manner as in Example 1 except for using dibenzofuran-4-boronic acid (made by Frontier Scientific Inc.) instead of 2-(9,9-dimethylfluorenyl)-boronic acid in Example 1. [0124] Tris[2-(dibenzofuran)-4-yl)pyridine-C³,N]iridium (III).

Example 29 (Synthesis of Ex. Comp. No. 147)

[0125] It is easy to synthesize the following compound in the same manner as in Example 1 except for using dibenzothiophene-4-boronic acid (made by Frontier Scientific Inc.) instead of 2-(9,9-dimethylfluorenyl)boronic acid in Example 1.

[0126] Tris[2-(benzothiophene)-4-yl)pyridine-C³,N]iridium (III).

20 Example 30 (Synthesis of Ex. Comp. No. 149)

[0127] It is easy to synthesize the following compound in the same manner as in Example 2 except for using dibenzofuran-4-boronic acid (made by Frontier Scientific Inc.) instead of 2-(9,9-dimethylfluorenyl)-boronic acid in Example 1. [0128] Tris[2,5-bis(dibenzofuran)-4-yl)pyridine-C³,N]iridium (III).

Example 31 (Synthesis of Ex. Comp. No. 150)

[0129] It is easy to synthesize the following compound in the same manner as in Example 2 except for using dibenzothiophene-4-boronic acid (made by Frontier Scientific Inc.) instead of 2-(9,9-dimethylfluorenyl)-boronic acid in Example 2.

[0130] Tris[2,5-bis(benzothiophene)-4-yl)pyridine-C³,N]iridium (III).

Example 32

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35 **[0131]** An organic EL device shown in Figure 1C was prepared in the following manner.

[0132] On a 100 nm-thick patterned ITO electrode (anode) formed on a 1.1 mm-thick no-alkali glass substrate, a 40 nm-thick charge transport layer of α -NPD was formed by vacuum deposition (10⁻⁴ Pa) at a deposition rate of 0.1 nm/sec. On the charge transport layer, a 40 nm-thick luminescence layer (co-deposited film) of CBP: iridium complex of Ex. Comp. No. 23 (93:7 by weight) was formed by co-vacuum deposition at deposition rates of 0.1 nm/sec (for CBP) and 0.09 nm/sec (for the iridium complex) by controlling heating conditions of deposition vessel. On the luminescence layer, a 40 nm-thick exciton diffusion prevention layer of BCP (Bathocuproine) was formed by vacuum deposition at a deposition rate of 0.1 nm/sec, and or the exciton diffusion prevention layer, a 20 nm-thick electron transport layer of Alq 3 was formed by vacuum deposition at a deposition rate of 0.1 nm/sec. Thereafter, or the electron transport layer, a 150 nm-thick aluminum electrode (cathode) was formed by vacuum deposition at a deposition rate of 1 nm/sec.

45 **[0133]** The thus-prepared organic EL device exhibited an EL spectrum showing λmax = 545 nm and luminescent efficiencies of 12.4 1m/W at a luminance of 100 cd/m² and 13.6 1m/W at a luminance of 600 cd/m².

Example 33

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[0134] An organic EL device was prepared and evaluated in the same manner as in Example 32 except for using Tris[2,5-bis(9,9-dimethylfluorene-2-yl)-pyridine-C³,N]iridium (III) (Ex. Comp. No. 43) in place of Tris[2-(9,9-dimethylfluorene-2-yl)pyridine-C³,N]iridium (III) (Ex. Comp. No. 23) synthesized in Example 1.

[0135] The thus-prepared organic EL device exhibited an EL spectrum showing λ max = 590 nm and luminescent efficiencies of 2.4 1m/W at a luminance of 100 cd/m² and 1.9 1m/W at a luminance of 300 cd/m².

Example 34 (Synthesis of Ex. Comp. No. 54)

[0136] It is easy to synthesize the following compound in the same manner as in Example 1 except for using 4-phenyl-

1-bromopyridine (made by General Intermediates of Canada) instead of 2-bromopyridine in Example 1.

[0137] Tris[2-(9,9-dimethylfluorene-2-yl)-4-phenylpyridine-C³,N]iridium (III).

[0138] As described above, according to the present invention, the metal coordination compound of the formula (1) characterized by the aromatic group of the formula (5) as a partial structure is an excellent material which exhibits a high emission quantum efficiency. The electroluminescence device (luminescence device) of the present invention using, as a luminescent center material, the metal coordination compound of the formula (1) is an excellent device which not only allows high-efficiency luminescence but also retains a high luminance for a long period and shows little deterioration by current passage. Further, the display apparatus using the electroluminescence device of the present invention exhibits excellent display performances.

[0139] An electroluminescence device having a layer containing a specific metal coordination compound is provided. The metal coordination compound is represented by formula (1) below:

$$ML_mL'_n$$
 (1).

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wherein M is a metal atom of Ir, Pt, Rh or Pd; L and L' are mutually different bidentate ligands; m is 1, 2 or 3 and n is 0, 1 or 2 with the proviso that m+n is 2 or 3; a partial structure MLm is represented by formula (2) shown below and a partial structure ML'_n is represented by formula (3) or (4) shown below:

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at least one of the optional substituent(s) of the cyclic groups, and the cyclic groups CyC1 and CyC2 include an aromatic group capable of having a substituent represented by the following formula (5):

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[0140] The metal coordination compound having the aromatic group is effective in providing high-efficiency luminescence and long-term high luminance.

Claims

1. A metal coordination compound represented by formula (1) below:

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$$ML_mL_n'$$
 (1),

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wherein M is a metal atom of Ir, Pt, Rh or Pd; L and L' are mutually different bidentate ligands; m is 1, 2 or 3 and n is 0, 1 or 2 with the proviso that m+n is 2 or 3; a partial structure MLm is represented by formula (2) shown below and a partial structure ML'_n is represented by formula (3) or (4) shown below:

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wherein CyN1 and CyN2 are each cyclic group capable of having a substituent, including a nitrogen atom and bonded to the metal atom M via the nitrogen atom; CyC1 and CyC2 are each cyclic group capable of having a substituent, including a carbon atom and bonded to the metal atom M via the carbon atom with the proviso that the cyclic group CyN1 and the cyclic group CyC1 are bonded to each other via a covalent bond and the cyclic group CyN2 and the cyclic group CyC2 are bonded to each other via covalent bond;

the optional substituent of the cyclic groups is selected from a halogen atom, cyano group, a nitro group, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH-or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -CH=CH- or -C=C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom);

E and G are independently a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 - 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom; and

at least one of the optional substituent(s) of the cyclic groups, and the cyclic groups CyC1 and CyC2 include an aromatic group capable of having a substituent represented by the following formula (5):

wherein the aromatic group of the formula (5) is bonded to CyN1, CyN2, CyC1 or CyC2 via a single bond when the aromatic group is the optional substituent(s) of the cyclic groups, and the aromatic group of the formula (5) is bonded to CyN1 or CyN2 via a single bond and bonded to the metal atom M via a single bond when the aromatic group is CyC1 or CyC2;

Y denotes C=O, CRR', $C=C(CN)_2$, O or S wherein R and R' are independently a hydrogen atom, a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -CH=CH- or -C \equiv C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a cyano atom, a nitro atom, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 - 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C \equiv C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom); and

the optional substituent of the aromatic group of the formula (5) is selected from a halogen atom, cyano group, a nitro group, a trialkylsilyl group of which the alkyl groups are independently a linear or branched alkyl group having 1 to 8 carbon atoms, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom, or an aromatic group capable of having a substituent (that is a halogen atom, a

cyano atom, a nitro atom, a linear or branched alkyl group having 1 to 20 carbon atoms of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom) with the proviso that an adjacent pair of substituents can be bonded to form a cyclic structure.

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2. A metal coordination compound according to Claim 1, including a partial structure ML'_n represented by the formula (3) in the formula (1).

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3. A metal coordination compound according to Claim 1, including a partial structure ML'n represented by the formula (4) in the formula (1).

4. A metal coordination compound according to Claim 1, wherein n is 0 in the formula (1).

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5. A metal coordination compound according to Claim 1, wherein the group Y in the formula (5) is C=O or CRR'. 6. A metal coordination compound according to Claim 1, wherein the cyclic groups CyC1 and CyC2 are independently

selected from phenyl group, thienyl group, thianaphthyl group, naphthyl group, pyrenyl group, 9-fluorenonyl group, fluorenyl group, dibenzofuryl group, dibenzothienyl group, or carbazolyl group, as an aromatic cyclic group capable of having a substituent with the proviso that the aromatic cyclic group can include one or two CH groups that can be replaced with a nitrogen atom.

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7. A metal coordination compound according to Claim 6, wherein the cyclic groups CyC1 and Cy2 are independently phenyl group or 2-fluorenyl group.

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8. A metal coordination compound according to Claim 1, wherein the cyclic groups CyN1 and CyN2 are independently selected from pyridyl group, pyridazinyl group, and pyrimidinyl group, as an aromatic cyclic group capable of having a substituent.

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A metal coordination compound according to Claim 8, wherein the aromatic cyclic group is pyridyl group.

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are independently non-substituted, or have a substituent selected from a halogen atom and a linear or branched alkyl group having 1 to 20 carbon atoms (of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH-, -C≡C-, or a divalent aromatic group capable of having a substituent (that is a halogen atom or a linear or branched alkyl group having 1 to 20 carbon atoms (of which the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O-, and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom)), and the alkyl group can include a hydrogen atom that can be optionally replaced with a fluorine atom).

10. A metal coordination compound according to Claim 1, wherein the cyclic groups CyN1, CyN2, CyC1 and CyC2

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11. A metal coordination compound according to Claim 1, wherein M in the formula (1) is iridium.

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12. A metal coordination compound according to Claim 1, which is represented by the following formula (6):

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$$R_2$$
 R_1
 R_4
 R_4

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wherein X denotes CRR', O or S where R and R' are independently a linear or branched alkyl group of formula: C_nH_{2n+1} - in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom:

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R2 denotes a hydrogen atom; a fluorine atom; a linear or branched alkyl group of formula: $C_nH_{2n+1}^-$ in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom; a phenyl group capable of having a substituent; a 9,9-dialkylfluorenyl group (of which the alkyl groups are independently a linear or branched alkyl group of formula: $C_nH_{2n+1}^-$ in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom); a dibenzofuranyl group capable of having a substituent; and a dibenzothienyl group capable of having a substituent; the optional substituent of phenyl group, 9,9-dialkylfluorenyl group, dibenzofuranyl group and dibenzothienyl group is a fluorine atom or a linear or branched alkyl group of formula: $C_nH_{2n+1}^-$ in which n is an integer of 1 - 20, the alkyl group can include one or non-neighboring two or more methylene groups that can be replaced with -O- and also can include a hydrogen atom that can be optionally replaced with a fluorine atom.

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13. An electroluminescence device, comprising: a pair of electrodes disposed on a substrate, and a luminescence unit comprising at least one organic compound disposed between the electrodes, wherein the organic compound comprises a metal coordination compound represented by the formula (1) in Claim 1.

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14. An electroluminescence device according to Claim 13, wherein a voltage is applied between the electrodes to emit light.

15. An electroluminescence device according to Claim 13, wherein a voltage is applied between the electrodes to emit

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phosphorescence.

16. A picture display apparatus, comprising an electroluminescence device according to Claim 13, and a means for supplying electric signals to the electroluminescence device.

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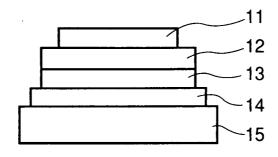


FIG. 1A

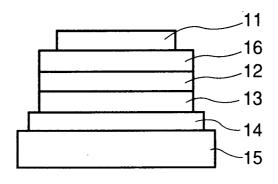


FIG. 1B

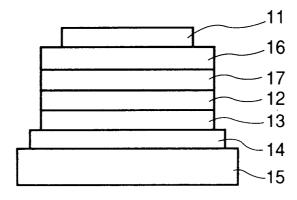


FIG. 1C

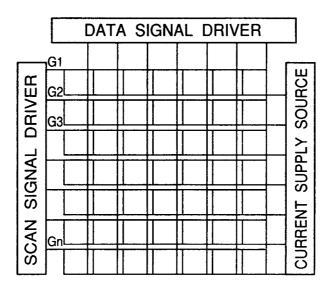


FIG. 2



专利名称(译)	金属配位化合物,发光装置和显示装置		
公开(公告)号	EP1238981A2	公开(公告)日	2002-09-11
申请号	EP2002005112	申请日	2002-03-07
[标]申请(专利权)人(译)	佳能株式会社		
申请(专利权)人(译)	佳能株式会社		
当前申请(专利权)人(译)	佳能株式会社		
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IPC分类号	H01L51/50 C07F15/00 C09K11/06 H01L51/00 H01L51/30		
CPC分类号	H01L51/0085 C07F15/0033 H01L51/0059 H01L51/0081 H01L51/5012		
优先权	2001064254 2001-03-08 JP 2002042522 2002-02-20 JP		
其他公开文献	EP1238981A3 EP1238981B1		
外部链接	<u>Espacenet</u>		

摘要(译)

提供了一种具有含有特定金属配位化合物的层的电致发光器件。金属配位化合物由下式(1)表示:MLmL'n(1),其中M是Ir,Pt,Rh或Pd的金属原子; L和L'是相互不同的二齿配体; m为1,2或3,n为0,1或2,条件是m+n为2或3;部分结构MLm由下面所示的式(2)表示,部分结构ML'n由下面所示的式(3)或(4)表示:至少一个环状基团的任选取代基,和环状基团CyC1和CyC2包括能够具有由下式(5)表示的取代基的芳族基团:具有芳族基团的金属配位化合物可有效地提供高效发光和长期高亮度。

