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Nasu et al.

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(54) COMPOUND, LIGHT-EMITTING MATERIAL, AND ORGANIC LIGHT-EMITTING DEVICE

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See application file for complete search history.

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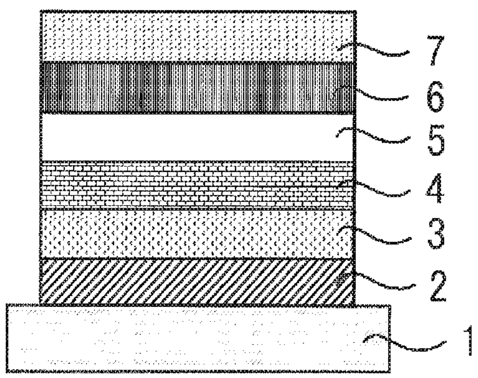
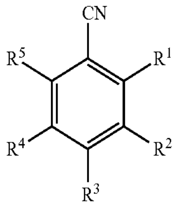
(57) **ABSTRACT**

A compound having a structure represented by the following general formula emits delayed fluorescent light, and is useful as a light-emitting material. One or more of R^1, R^2,
(Continued)



R^3, R^4, and R^5 represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, or a 10-phenoxazyl group or 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position. The balance thereof represents a hydrogen atom or a substituent.



11 Claims, 5 Drawing Sheets

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Fig. 1

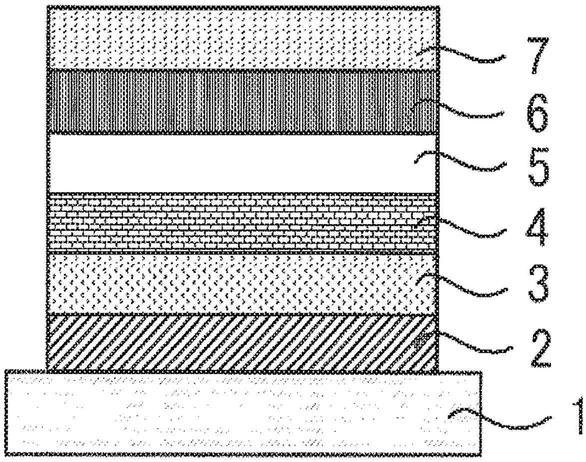

7
6
5
4
3
2
1

Fig. 2

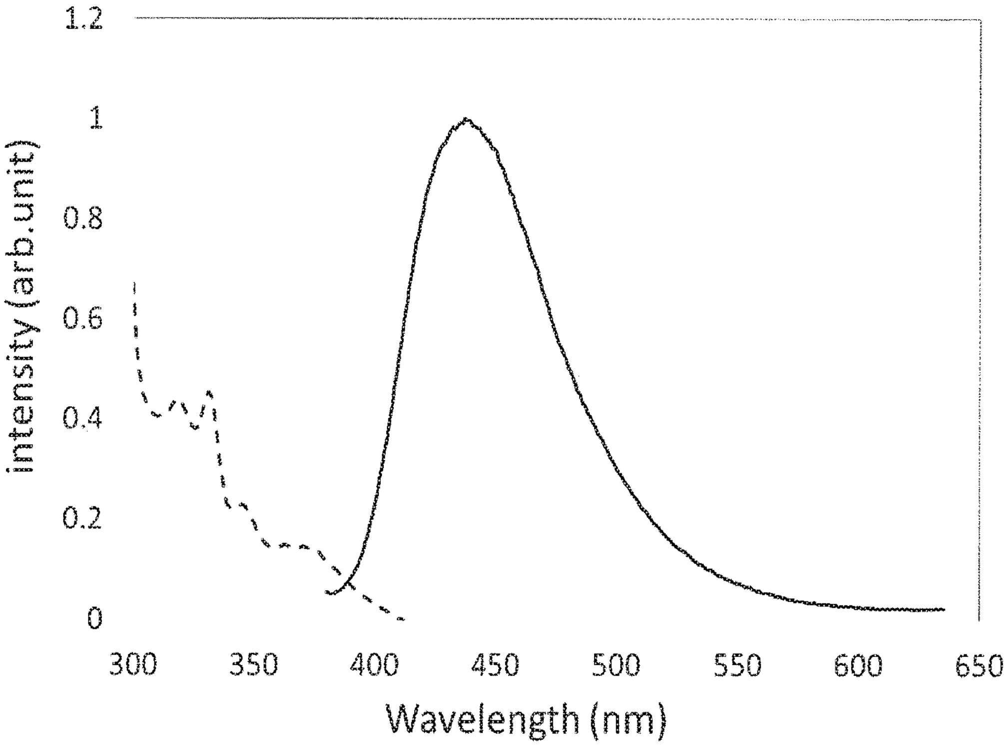
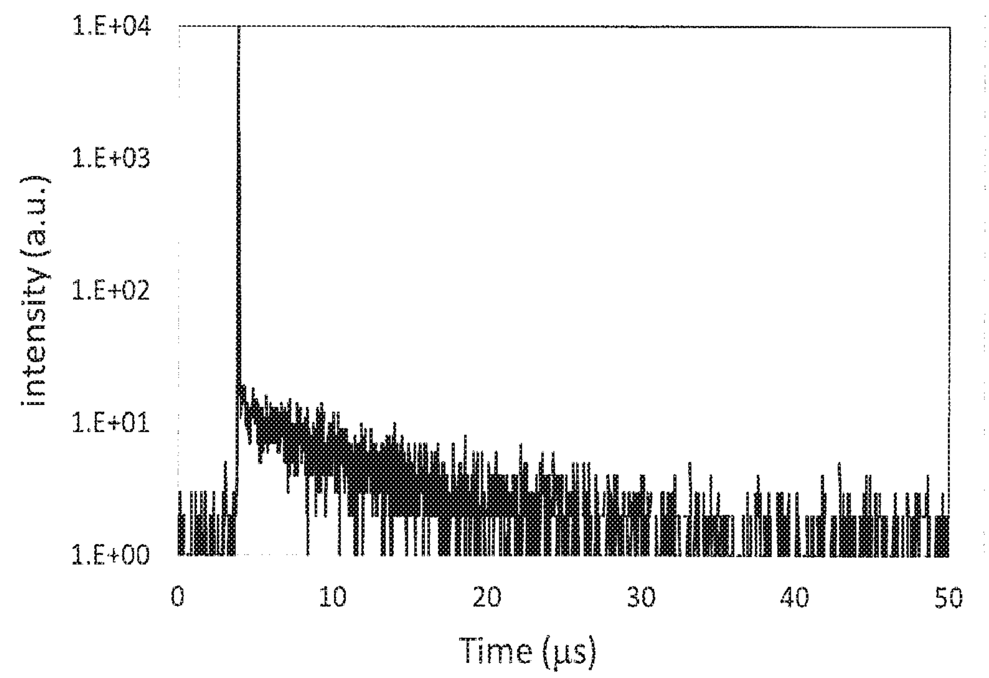
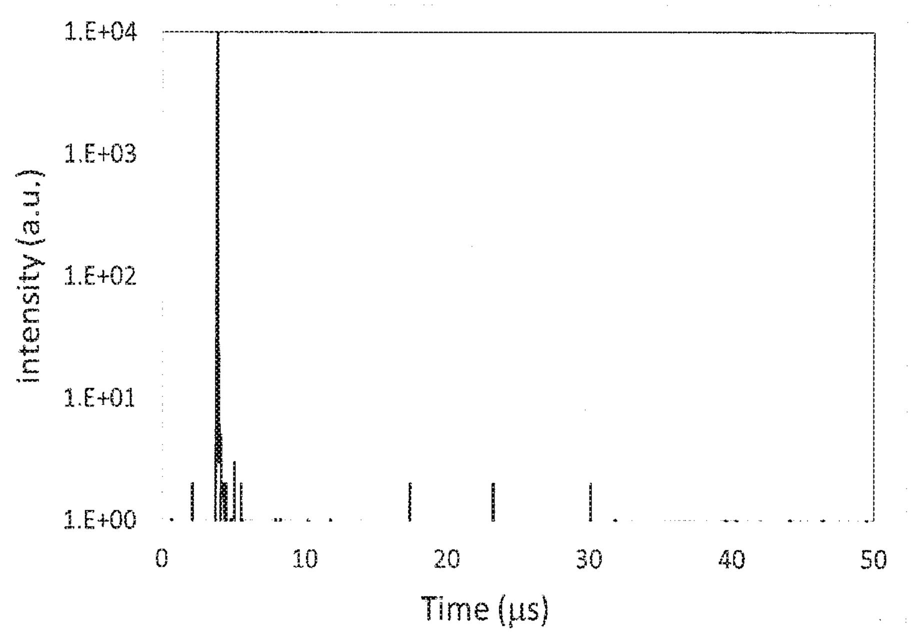

1.2
1
0.8
0.6
0.4
0.2
0
intensity (arb.unit)
300
350
400
450
500
550
600
650
Wavelength (nm)

Fig. 3



1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
intensity (a.u.)
0
10
20
30
40
50
Time (μs)

Fig. 4



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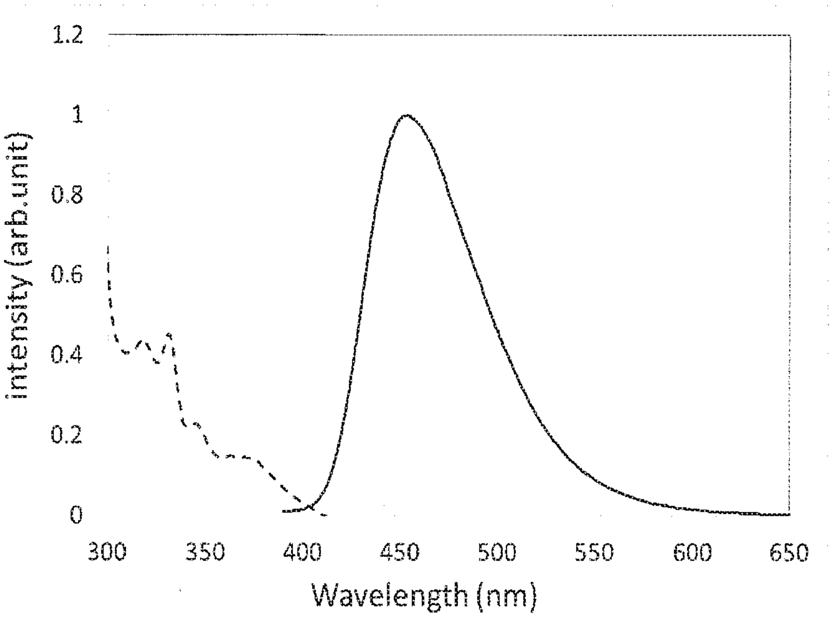
1.E+03
1.E+02
1.E+01
1.E+00
intensity (a.u.)
0
10
20
30
40
50
Time (μs)

Fig. 5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1
0.8
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0.4
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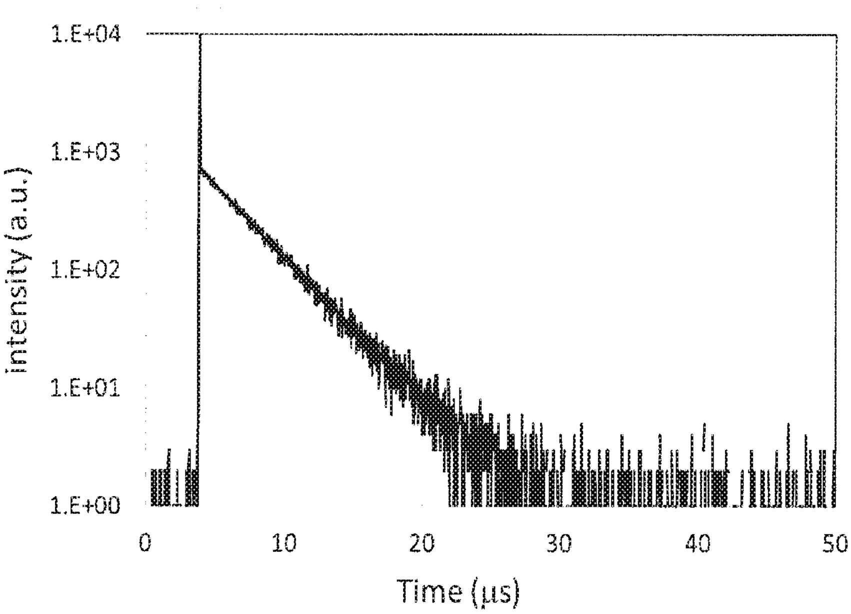
intensity (arb.unit)
300
350
400
450
500
550
600
650
Wavelength (nm)

Fig. 6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1.E+03
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1.E+00
intensity (a.u.)
0
10
20
30
40
50
Time (μs)

Fig. 7

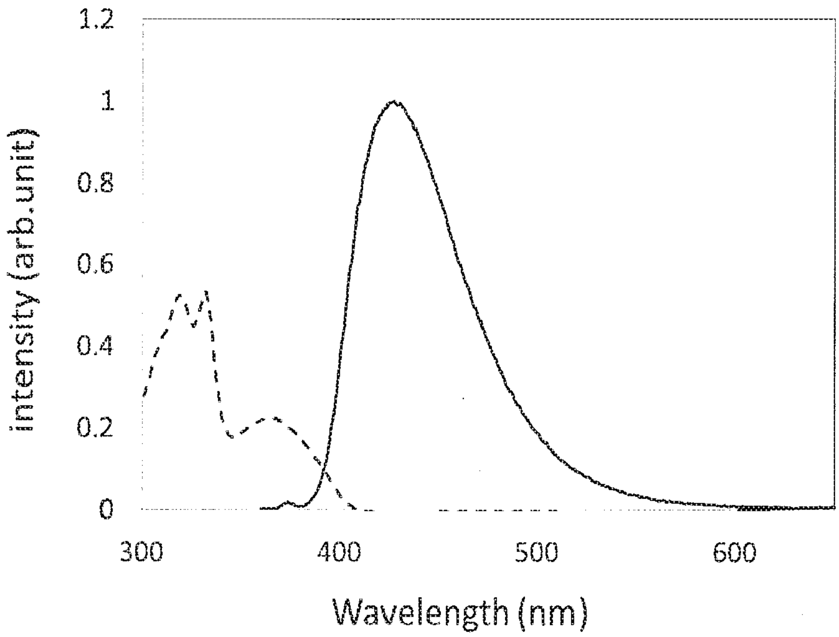
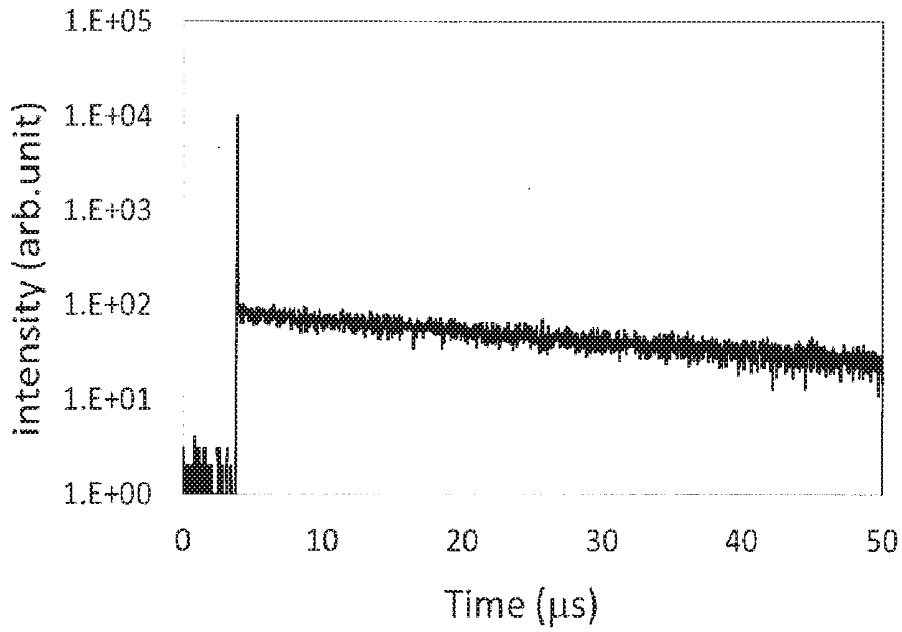

1.2
1
0.8
0.6
0.4
0.2
0
300
400
500
600
intensity (arb.unit)
Wavelength (nm)

Fig. 8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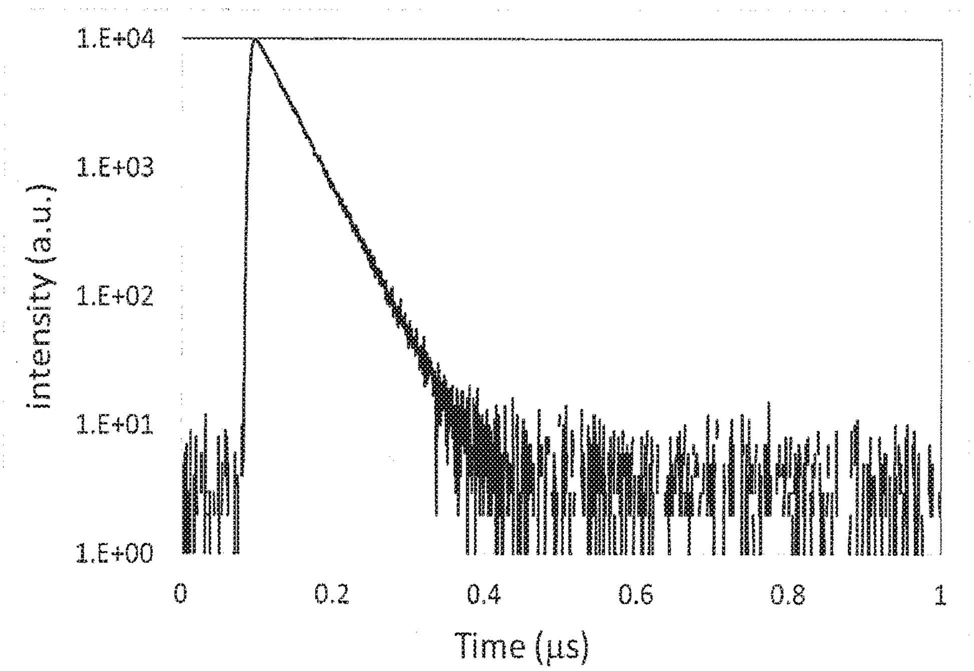
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
0
10
20
30
40
50
intensity (arb.unit)
Time (μs)

Fig. 9



COMPOUND, LIGHT-EMITTING MATERIAL, AND ORGANIC LIGHT-EMITTING DEVICE

TECHNICAL FIELD

The present invention relates to a compound that is useful as a light-emitting material, and an organic light-emitting device using the same.

BACKGROUND ART

An organic light-emitting device, such as an organic electroluminescent device (organic EL device), has been actively studied for enhancing the light emission efficiency thereof. In particular, various studies for enhancing the light emission efficiency have been made by newly developing and combining an electron transporting material, a hole transporting material, a light-emitting material, and the like constituting an organic electroluminescent device. There are studies focusing on a compound emitting delayed fluorescent light.

Delayed fluorescent light is fluorescent light emitted through such a mechanism that a compound in an excited state through application of energy undergoes reverse intersystem crossing from the excited triplet state to the excited singlet state, and then the excited singlet state returns to the ground state to emit the fluorescent light, and the delayed fluorescent light is fluorescent light that is observed with a delay from the fluorescent light directly emitted from the excited singlet state (normal fluorescent light). With the use of the compound capable of emitting delayed fluorescent light as a light-emitting material of an organic electroluminescent device, the energy of the excited triplet state, which has a large formation probability, can be converted to fluorescent light and thus can be effectively utilized for light emission, from which a high light emission efficiency can be expected. Accordingly, compounds emitting delayed fluorescent light have been actively developed, and there have been some proposals of the utilization of the compound as a light-emitting material.

For example, PTL 1 describes that a compound having a benzene ring having substituted thereon two cyano groups and one or more carbazolyl group or the like is a compound capable of emitting delayed fluorescent light. The literature describes that the use of the compound as a light-emitting material of an organic electroluminescent device and the like can enhance the light emission efficiency.

CITATION LIST

Patent Literature

PTL 1: Japanese Patent No. 5,366,106

SUMMARY OF INVENTION

Technical Problem

However, it is still unclear as to what type of chemical structure can generally emit delayed fluorescent light. For example, compounds that are similar to the compound described in PTL 1 do not necessarily emit delayed fluorescent light, and it is difficult to estimate from the structure as to whether or not delayed fluorescent light is emitted therefrom. Accordingly, for employing compounds capable of emitting delayed fluorescent light from a wider range of compounds, it is considered that a compound capable of emitting delayed fluorescent light is necessarily discovered and utilized from outside the range of the compounds proposed by PTL 1.

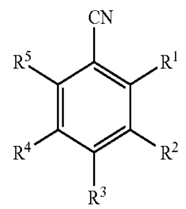
Under the circumstances, the present inventors have made earnest investigations for discovering a compound emitting delayed fluorescent light even though having a structure that is not described in PTL 1. The inventors have made earnest investigations for eliciting the general formula of the compound and generalizing the structure of an organic light-emitting device having a high light emission efficiency.

Solution to Problem

As a result of the earnest investigations, the inventors have found that a compound capable of emitting delayed fluorescent light exists in compounds having a structure containing a benzene ring having only one cyano group substituted thereon. The inventors have reached knowledge that the use of the compound capable of emitting delayed fluorescent light as a light-emitting material can provide an organic light-emitting device having a high light emission efficiency. The invention is proposed based on the knowledge and specifically has the following constitution.

[1] A compound having a structure represented by the following general formula (1):

General Formula (1)



wherein in the general formula (1), one or more of R^1, R^2, R^3, R^4, and R^5 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position. The balance thereof represents a hydrogen atom or a substituent, provided that the substituent excludes a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of i-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position. One or more of carbon atoms constituting ring skeletons of the 9-carbazolyl group, the 10-phenoxazyl group, and the 10-phenothiazyl group may be replaced by a nitrogen atom.

[2] The compound according to the item [1], wherein the substituent represents a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted thioalkoxy group, a substituted or unsubstituted aryl group, a substituted or unsubstituted heteroaryl group, a substituted or unsubstituted aryloxy group, a substituted or unsubstituted heteroaryloxy group, a substituted or unsubstituted thioaryloxy group, a substituted or unsubstituted thioheteroaryloxy group, a secondary amino group, a tertiary amino group, or a substituted or unsubstituted silyl group.

[3] The compound according to the item [1] or [2], wherein one to three of R^1, R^2, R^3, R^4, and R^5 each independently represent a 9-carbazolyl group having a sub-

stituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position, at least one of the balance thereof each independently represents a 9-carbazolyl group unsubstituted at the 1-position and the 8-position, a 10-phenoxazyl group unsubstituted at the 1-position and the 9-position or a 10-phenothiazyl group unsubstituted at the 1-position and the 9-position, and one or more of carbon atoms constituting ring skeletons of the 9-carbazolyl group, the 10-phenoxazyl group, and the 10-phenothiazyl group may be replaced by a nitrogen atom.

[4] The compound according to any one of the items [1] to [3], wherein two to four of R^1, R^2, R^3, R^4, and R^5 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group.

[5] The compound according to any one of the items [1] to [4], wherein R^1, R^3, and R^5 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group.

[6] The compound according to the item [5], wherein R^3 represents a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position.

[7] The compound according to the item [6], wherein R^1 and R^5 each independently represent a 9-carbazolyl group unsubstituted at the 1-position and the 8-position, a 10-phenoxazyl group unsubstituted at the 1-position and the 9-position or a 10-phenothiazyl group unsubstituted at the 1-position and the 9-position.

[8] The compound according to any one of the items [1] to [4], wherein R^2 and R^4 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group.

[9] The compound according to the item [8], wherein R^2 and R^4 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position.

[10] A light-emitting material containing the compound according to any one of the items [1] to [9].

[11] The light-emitting material according to the item [10], wherein the light-emitting material emits delayed fluorescent light.

[12] An organic light-emitting device containing a substrate having thereon a light-emitting layer containing the light-emitting material according to the item [10] or [11].

[13] The organic light-emitting device according to the item [12], wherein the organic light-emitting device is an organic electroluminescent device.

[14] The organic light-emitting device according to the item [12] or [13], wherein the light-emitting layer contains the compound according to any one of the items [1] to [9] and a host material.

[15] A delayed fluorescent material having a structure represented by the general formula (1).

Advantageous Effects of Invention

The compound of the invention is useful as a light-emitting material. The compound of the invention can emit delayed fluorescent light, and the triplet excitation energy thereof can be effectively utilized for light emission. Accordingly, the organic light-emitting device using the compound of the invention as a light-emitting material can achieve a high light emission efficiency.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic cross sectional view showing an example of a layer structure of an organic electroluminescent device.

FIG. **2** is the light emission spectrum and the light absorption spectrum of the toluene solution of the compound 291 in Example 1.

FIG. **3** is the transient decay curve of the toluene solution of the compound 291 in Example 1.

FIG. **4** is the transient decay curve of the toluene solution of the comparative compound 1.

FIG. **5** is the light emission spectrum and the light absorption spectrum of the toluene solution of the compound 241 in Example 2.

FIG. **6** is the transient decay curve of the toluene solution of the compound 241 in Example 2.

FIG. **7** is the light emission spectrum and the light absorption spectrum of the toluene solution of the compound 135 in Example 3.

FIG. **8** is the transient decay curve of the toluene solution of the compound 135 in Example 3.

FIG. **9** is the transient decay curve of the toluene solution of the comparative compound 2.

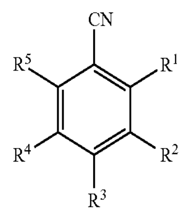
DESCRIPTION OF EMBODIMENTS

The contents of the invention will be described in detail below. The constitutional elements may be described below with reference to representative embodiments and specific examples of the invention, but the invention is not limited to the embodiments and the examples. In the description herein, a numerical range expressed as "to" means a range that includes the upper limit and/or the lower limit. In the invention, the hydrogen atom that is present in the compound used in the invention is not particularly limited in isotope species, and for example, all the hydrogen atoms in the molecule may be ^1H, and all or a part of them may be ^2H (deuterium (D)).

Compound Represented by General Formula (1)

The light-emitting material of the invention contains a compound having a structure represented by the following general formula (1).

General Formula (1)



In the general formula (1), one or more of R^1, R^2, R^3, R^4, and R^5 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of i-position and 9-position.

The 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, the 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or the 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position (hereinafter, the groups may be collectively referred to as "9-carbazolyl group and the like having a substituent at a specific position") may be only one or two or more of R^1, R^2, R^3, R^4, and R^5.

In the case where only one of R^1, R^2, R^3, R^4, and R^5 is the 9-carbazolyl group and the like having a substituent at a specific position, any one of R^2, R^3, and R^4 is preferably the 9-carbazolyl group and the like having a substituent at a specific position, and more preferably, R^3 is the 9-carbazolyl group and the like having a substituent at a specific position. In the case where two of R^1, R^2, R^3, R^4, and R^5 are the 9-carbazolyl group and the like having a substituent at a specific position, R^1 and R^5 or R^2 and R^4 are preferably the 9-carbazolyl group and the like having a substituent at a specific position, and more preferably, R^2 and R^4 are the 9-carbazolyl group and the like having a substituent at a specific position. In the case where three of R^1, R^2, R^3, R^4, and R^5 are the 9-carbazolyl group and the like having a substituent at a specific position, R^2, R^3 and R^4 are preferably the 9-carbazolyl group and the like having a substituent at a specific position. In the case where four of R^1, R^2, R^1, R^4, and R^5 are the 9-carbazolyl group and the like having a substituent at a specific position, R^1, R^2, R^4 and R^5 are preferably the 9-carbazolyl group and the like having a substituent at a specific position. The preferred compound is a compound in which R^3 in the general formula (1) is the 9-carbazolyl group and the like having a substituent at a specific position and a compound in which R^2 and R^4 in the general formula (1) are the 9-carbazolyl group and the like having a substituent at a specific position. When there is a plurality of the 9-carbazolyl group and the like having a substituent at a specific position in the general formula (1), they may be the same or different from each other but are preferably the same. Also, in the compound represented by the general formula (1), R^1 and R^5, and R^2 and R^4 are preferably the same, respectively.

In the 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, the position having a substituent may be only the 1-position, only the 8-position or both the 1-position and the 8-position but is preferably both the 1-position and the 8-position. When the 9-carbazolyl group has substituents at both the 1-position and the 8-position, the substituents may be the same or different from each other but are preferably the same. The positions of the 9-carbazolyl group except the 1-position and the 8-position may have substituents or may be unsubstituted. In the case where the 9-carbazolyl group has a substituent, the substitution position is preferably at least one of the 3-position and the 6-position. That is, the substitution positions of only the 3-position, only the 6-position or both the 3-position and the 6-position are all preferable.

In the 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position, the position having a substituent may be only the 1-position, only the 9-position or both the 1-position and the 9-position but is preferably both the 1-position and the 9-position. When the 10-phenoxazyl group has substituents at both the 1-position and the 9-position, the substituents may be the same or different from each other but are preferably the same. The positions of the 10-phenoxazyl group except the 1-position and the 9-position may have substituents or may be unsubstituted. In the case where the 10-phenoxazyl group has a substituent, the substitution position is preferably at least one of the 3-position and the 7-position. That is, the substitution positions of only the 3-position, only the 7-position or both the 3-position and the 7-position are all preferable.

In the 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position, the position having a substituent may be only the 1-position, only the 9-position or both the 1-position and the 9-position but is preferably both the 1-position and the 9-position. When the 10-phenothiazyl group has substituents at both the 1-position and the 9-position, the substituents may be the same or different from each other but are preferably the same. The positions of the 10-phenothiazyl group except the 1-position and the 9-position may have substituents or may be unsubstituted. In the case where the 10-phenothiazyl group has a substituent, the substitution position is preferably at least one of the 3-position and the 7-position. That is, the substitution positions of only the 3-position, only the 7-position or both the 3-position and the 7-position are all preferable.

Of the 9-carbazolyl group and the like having a substituent at a specific position, the 9-carbazolyl group having a substituent at at least one of 1-position and 8-position is preferable, the 9-carbazolyl group having substituents both at the 1-position and the 8-position is more preferable, and the 9-carbazolyl group having substituents both at the 1-position and the 8-position and both at the 3-position and the 6-position is further preferable.

As the substituent that can be substituted for the 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, the 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or the 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position, a hydroxy group, a halogen atom, a cyano group, an alkyl group, an alkoxy group, a thioalkoxy group, a secondary amino group, a tertiary amino group, an acyl group, an aryl group, a heteroaryl group, an aryloxy group, a heteroaryloxy group, a thioaryloxy group, a thioheteroaryloxy group, an alkenyl group, an alkynyl group, an alkoxycarbonyl group, an alkylsulfonyl group, a haloalkyl group, an amid group, an alkylamide group, a silyl group, a trialkylsilylalkyl group, a trialkylsilylalkenyl group, a trialkylsilylalkynyl group, a nitro group and the like may be exemplified. In these specific examples, the substituent that is capable of being further substituted with a substituent may be substituted. The preferred substituent is a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted thioalkoxy group, a substituted or unsubstituted aryl group, a substituted or unsubstituted heteroaryl group, a substituted or unsubstituted aryloxy group, a substituted or unsubstituted heteroaryloxy group, a substituted or unsubstituted thioaryloxy group, a substituted or unsubstituted thioheteroaryloxy group, a secondary amino group, a tertiary amino group or a substituted or unsubstituted silyl group. The more preferred substitute is a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted aryl group, and a substituted or unsubstituted heteroaryl group. The particularly preferred substitute is a substituted or unsubstituted alkyl group. The carbon number of the substitutes is 1 to 20, more preferably 1 to 10, and further preferably 1 to 5 in the substituted or unsubstituted alkyl group, is 1 to 20 in the substituted or unsubstituted alkoxy group and the substituted or unsubstituted thioalkoxy group, is 6 to 40 in the substituted or unsubstituted aryl group, the substituted or unsubstituted aryloxy group and the substituted or unsubstituted thioaryloxy group, is 3 to 40 in the substituted or unsubstituted heteroaryl group, the substituted or unsubstituted heteroaryloxy group and the substituted or unsubstituted thioheteroaryloxy group, is 1 to 20 in the secondary amino group and the tertiary amino group, and is 3 to 20 in the silyl group substituted with an alkyl group. Here, in the case where each substituent is further substituted with a substituent (for example, in the case of the substituted alkyl group and the like), the carbon number means a summed carbon number of the carbon number of a substituted substituent and the carbon number of a substituent substituted for the substituent.

In the case where one to four of R^1, R^2, R^3, R^4, and R^5 in the general formula (1) each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position, the balance thereof represents a hydrogen atom or a substituent, provided that the substituent excludes a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position. For the preferred range of the substituent, reference may be made to the preferred range of the substituent that can be substituted for the 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, and the like. However, the "substituted or unsubstituted heteroaryl group" does not include a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position.

In the case where one to three of R^1, R^2, R^3, R^4, and R^5 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position (the 9-carbazolyl group and the like having a substituent at a specific position), at least one of the balance thereof each independently is preferably a 9-carbazolyl group of which the 1-position and the 8-position are not substituted, a 10-phenoxazyl group of which the 1-position and the 9-position are not substituted or a 10-phenothiazyl group of which the 1-position and the 9-position are not substituted (hereinafter, the groups may be collectively referred to as "9-carbazolyl group and the like of which specific positions are not substituted"). Also, a substitute except the cyano group is preferably selected. Particularly, in the case where one of R^1, R^2, R^3, R^4, and R^5 represent the 9-carbazolyl group and the like having a substituent at a specific position, at least two of the remaining four are preferably the 9-carbazolyl group and the like of which specific positions are not substituted. Among of them, more preferably, R^3 is the 9-carbazolyl group and the like having a substituent at a specific position and R^1 and R^5 are the 9-carbazolyl group and the like of which specific positions are not substituted. In the meantime, in the case where two or three of R^1, R^2, R^3, R^4, and R^5 are the 9-carbazolyl group and the like having a substituent at a specific position, at least one of the balance thereof is preferably the 9-carbazolyl group and the like of which specific positions are not substituted. However, all of the balance is also preferably a hydrogen atom.

In the 9-carbazolyl group of which the 1-position and the 8-position are not substituted, the positions except the 1-position and the 8-position may have substituents or may be unsubstituted. In the case where the 9-carbazolyl group has a substituent, the substitution position is preferably at least one of the 3-position and the 6-position. In the 10-phenoxazyl group of which the 1-position and the 9-position are not substituted and the 10-phenothiazyl group of which the 1-position and the 9-position are not substituted, the positions except the 1-position and the 9-position may have substituents or may be unsubstituted. In the case where the 10-phenoxazyl group and the 10-phenothiazyl group have a substituent, the substitution position is preferably at least one of the 3-position and the 7-position. For the preferred ranges of the substituent that can be substituted for the 9-carbazolyl group and the like of which specific positions are not substituted, reference may be made to the preferred ranges of the substituent that can be substituted for the 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, and the like.

Of the 9-carbazolyl group and the like of which specific positions are not substituted, a 9-carbazolyl group of which the 1-position and the 8-position are not substituted is preferable, and a 9-carbazolyl group of which all of the 1-position to the 8-position are not substituted is more preferable.

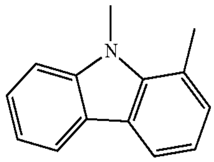
The compound represented by the general formula (1) of the present invention is preferably a compound in which two to four of R^1, R^2, R^3, R^4, and R^5 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group, and is more preferably a compound in which R^1, R^3, and R^5 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group, and is further preferably a compound in which R^2 and R^4 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group. In the case where the 9-carbazolyl group, the 10-phenoxazyl group or the 10-phenothiazyl group has a plurality of substitutes, the substitutes may be the same or different from each other.

Also, one or more of carbon atoms constituting ring skeletons of the 9-carbazolyl group, the 10-phenoxazyl group or the 10-phenothiazyl group in each of R^1, R^2, R^3, R^4, and R^5 may be replaced by a nitrogen atom. The number of carbon atoms that are replaced by a nitrogen atom is not particularly limited, and is preferably from 1 to 4, and more preferably 1 or 2.

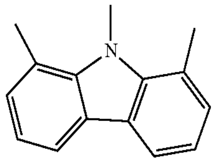
In the below, specific examples of "9-carbazolyl group having a substituent at at least one of 1-position and 8-position" represented by one or more of R^1, R^2, R^3, R^4, and R^5 in the general formula (1), specific examples of "substitute" represented by the balance except one or more of R^1, R^2, R^3, R^4, and R^5, and specific examples of a compound represented by the general formula (1) are exemplified. In the present invention, "9-carbazolyl group having a substituent at at least one of 1-position and 8-position" represented by one or more of R^1, R^2, R^3, R^4, and R^5 in the general formula (1), "substitute" represented by the balance except one or more of R^1, R^2, R^3, R^4, and R^5, and a compound represented by the general formula (1) are not construed as being limited to the specific examples.

First, the specific examples (m-D1 to m-D9) of "9-carbazolyl group having a substituent at at least one of 1-position and 8-position" represented by one or more of R^1, R^2, R^3, R^4, and R^5 in the general formula (1) are enumerated.

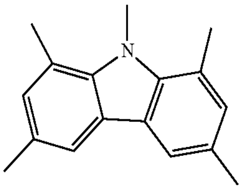
m-D1



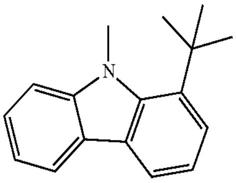
m-D2



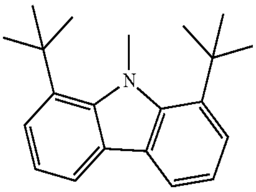
m-D3



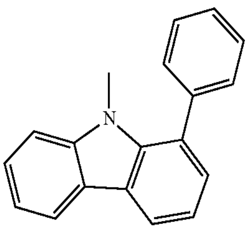
m-D4



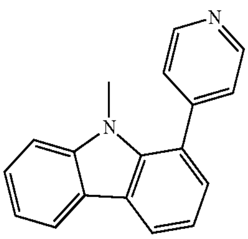
m-D5



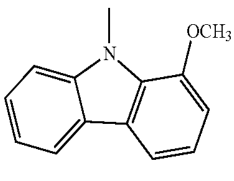
m-D6



m-D7



m-D8



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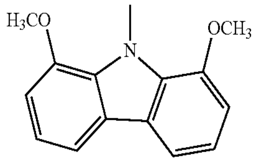
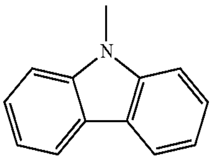
m-D9

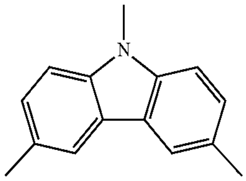


The specific examples (Cz, Cz1 to Cz11) of "substitute" represented by the balance except the "one or more" of R^1, R^2, R^3, R^4, and R^5 in the general formula (1) are enumerated.

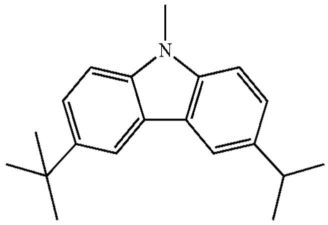
Cz



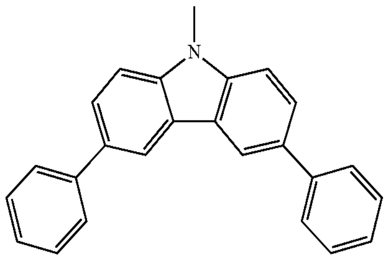
Cz1



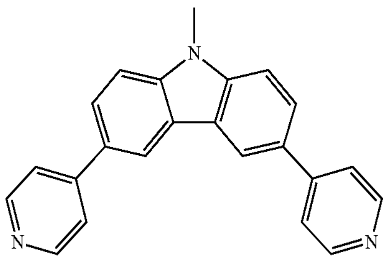
Cz2



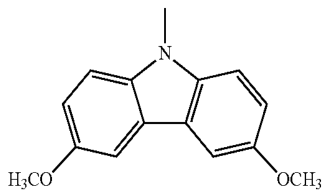
Cz3



Cz4



Cz5



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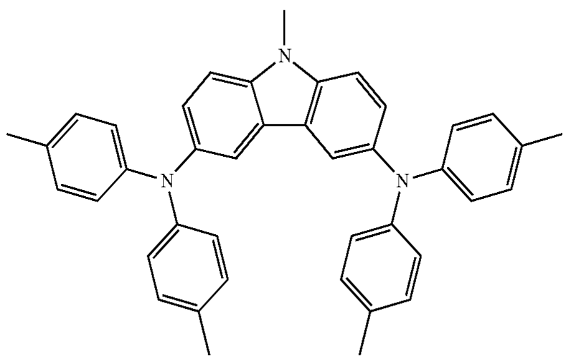
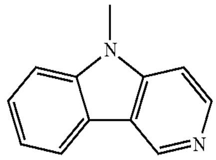
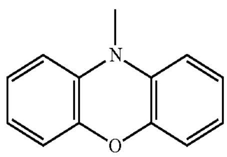
Cz6



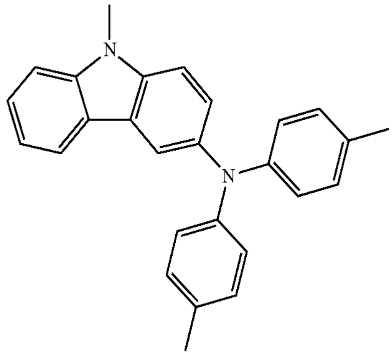
Cz7



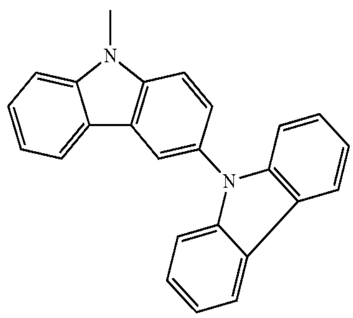
Cz8



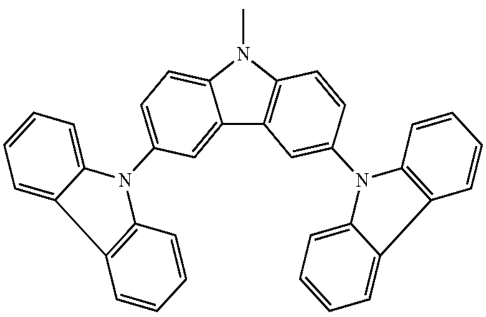
Cz9



Cz10



Cz11



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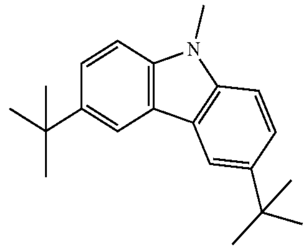
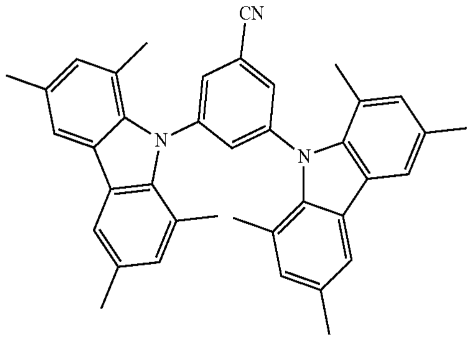
Cz12

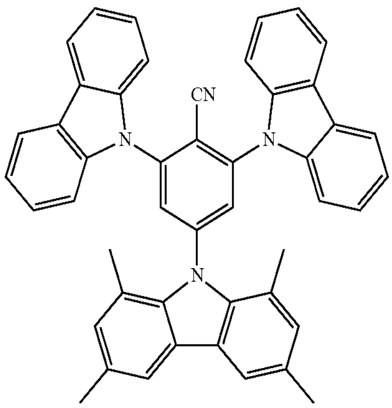


The specific examples of a compound represented by the general formula (1) are enumerated.

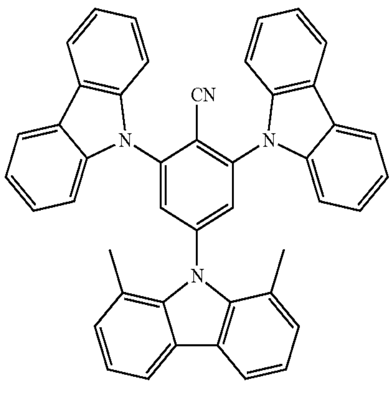
Compound 291



Compound 241



Compound 135



The specific examples including the three compound examples are shown in below Tables.

TABLE 1-1

No	R^1	R^2	R^3	R^4	R^5
1	m-D1	Cz	Cz	Cz	Cz
2	Cz	m-D1	Cz	Cz	Cz
3	Cz	Cz	m-D1	Cz	Cz
4	m-D1	Cz	Cz	Cz	H
5	Cz	m-D1	Cz	Cz	H
6	Cz	Cz	m-D1	Cz	H
7	Cz	Cz	Cz	m-D1	H
8	m-D1	Cz	Cz	H	Cz
9	Cz	m-D1	Cz	H	Cz
10	Cz	Cz	m-D1	H	Cz
11	Cz	Cz	Cz	H	m-D1
12	m-D1	Cz	H	Cz	Cz
13	Cz	m-D1	H	Cz	Cz
14	m-D1	Cz	Cz	H	H
15	Cz	m-D1	Cz	H	H
16	Cz	Cz	m-D1	H	H
17	m-D1	Cz	H	Cz	H
18	Cz	m-D1	H	Cz	H
19	Cz	Cz	H	m-D1	H
20	m-D1	H	Cz	Cz	H
21	Cz	H	m-D1	Cz	H
22	Cz	H	Cz	m-D1	H
23	H	m-D1	Cz	Cz	H
24	H	Cz	m-D1	Cz	H
25	m-D1	Cz	H	H	Cz
26	Cz	m-D1	H	H	Cz
27	Cz	Cz	H	H	m-D1
28	m-D1	H	Cz	H	Cz
29	Cz	H	m-D1	H	Cz
30	m-D1	Cz	H	H	H
31	Cz	m-D1	H	H	H
32	m-D1	H	Cz	H	H
33	Cz	H	m-D1	H	H
34	H	m-D1	Cz	H	H
35	H	Cz	m-D1	H	H
36	m-D1	H	H	Cz	H
37	Cz	H	H	m-D1	H
38	H	m-D1	H	Cz	H
39	m-D1	H	H	H	Cz
40	m-D1	H	H	H	H
41	H	m-D1	H	H	H
42	H	H	m-D1	H	H
43	m-D1	m-D1	Cz	Cz	H
44	m-D1	Cz	m-D1	Cz	H
45	m-D1	Cz	Cz	m-D1	H
46	Cz	m-D1	m-D1	Cz	H
47	Cz	m-D1	Cz	m-D1	H
48	Cz	Cz	m-D1	m-D1	H
49	m-D1	m-D1	Cz	H	Cz
50	m-D1	Cz	m-D1	H	Cz
51	m-D1	Cz	Cz	H	m-D1
52	Cz	m-D1	m-D1	H	Cz
53	Cz	m-D1	Cz	H	m-D1
54	Cz	Cz	m-D1	H	m-D1
55	m-D1	m-D1	H	Cz	Cz
56	m-D1	Cz	H	m-D1	Cz
57	m-D1	Cz	H	Cz	m-D1
58	Cz	m-D1	H	m-D1	Cz

TABLE 1-2

59	m-D1	m-D1	Cz	H	H
60	m-D1	Cz	m-D1	H	H
61	Cz	m-D1	m-D1	H	H
62	m-D1	m-D1	H	Cz	H
63	m-D1	Cz	H	m-D1	H
64	Cz	m-D1	H	m-D1	H
65	m-D1	H	m-D1	Cz	H
66	m-D1	H	Cz	m-D1	H
67	Cz	H	m-D1	m-D1	H
68	H	m-D1	m-D1	Cz	H
69	H	m-D1	Cz	m-D1	H
70	m-D1	m-D1	H	H	Cz
71	m-D1	Cz	H	H	m-D1
72	Cz	m-D1	H	H	m-D1

TABLE 1-2-continued

73	m-D1	H	m-D1	H	Cz
74	m-D1	H	Cz	H	m-D1
75	m-D1	m-D1	H	H	H
76	m-D1	H	m-D1	H	H
77	H	m-D1	m-D1	H	H
78	m-D1	H	H	m-D1	H
79	H	m-D1	H	m-D1	H
80	m-D1	H	H	H	m-D1
81	m-D1	m-D1	m-D1	Cz	Cz
82	m-D1	m-D1	Cz	m-D1	Cz
83	m-D1	m-D1	Cz	Cz	m-D1
84	m-D1	Cz	m-D1	m-D1	Cz
85	m-D1	Cz	m-D1	Cz	m-D1
86	m-D1	m-D1	m-D1	Cz	H
87	m-D1	m-D1	Cz	m-D1	H
88	m-D1	Cz	m-D1	Cz	H
89	Cz	m-D1	m-D1	m-D1	H
90	m-D1	m-D1	m-D1	H	Cz
91	m-D1	m-D1	Cz	H	m-D1
92	m-D1	Cz	m-D1	H	m-D1
93	Cz	m-D1	m-D1	H	m-D1
94	m-D1	m-D1	H	m-D1	Cz
95	m-D1	m-D1	H	Cz	m-D1
96	m-D1	m-D1	m-D1	H	H
97	m-D1	m-D1	H	m-D1	H
98	m-D1	H	m-D1	m-D1	H
99	H	m-D1	m-D1	m-D1	H
100	m-D1	m-D1	m-D1	m-D1	Cz
101	m-D1	m-D1	m-D1	Cz	m-D1
102	m-D1	m-D1	Cz	m-D1	m-D1
103	m-D1	m-D1	m-D1	m-D1	H
104	m-D1	m-D1	m-D1	H	m-D1
105	m-D1	m-D1	H	m-D1	m-D1
106	m-D1	m-D1	m-D1	m-D1	m-D1
107	m-D2	Cz	Cz	Cz	Cz
108	Cz	m-D2	Cz	Cz	Cz
109	Cz	Cz	m-D2	Cz	Cz
110	m-D2	Cz	Cz	Cz	H
111	Cz	m-D2	Cz	Cz	H
112	Cz	Cz	m-D2	Cz	H
113	Cz	Cz	Cz	m-D2	H
114	m-D2	Cz	Cz	H	Cz
115	Cz	m-D2	Cz	H	Cz
116	Cz	Cz	m-D2	H	Cz
117	Cz	Cz	Cz	H	m-D2

TABLE 1-3

118	m-D2	Cz	H	Cz	Cz
119	Cz	m-D2	H	Cz	Cz
120	m-D2	Cz	Cz	H	H
121	Cz	m-D2	Cz	H	H
122	Cz	Cz	m-D2	H	H
123	m-D2	Cz	H	Cz	H
124	Cz	m-D2	H	Cz	H
125	Cz	Cz	H	m-D2	H
126	m-D2	H	Cz	Cz	H
127	Cz	H	m-D2	Cz	H
128	Cz	H	Cz	m-D2	H
129	H	m-D2	Cz	Cz	H
130	H	Cz	m-D2	Cz	H
131	m-D2	Cz	H	H	Cz
132	Cz	m-D2	H	H	Cz
133	Cz	Cz	H	H	m-D2
134	m-D2	H	Cz	H	Cz
135	Cz	H	m-D2	H	Cz
136	m-D2	Cz	H	H	H
137	Cz	m-D2	H	H	H
138	m-D2	H	Cz	H	H
139	Cz	H	m-D2	H	H
140	H	m-D2	Cz	H	H
141	H	Cz	m-D2	H	H
142	m-D2	H	H	Cz	H
143	Cz	H	H	m-D2	H
144	H	m-D2	H	Cz	H
145	m-D2	H	H	H	Cz
146	m-D2	H	H	H	H

TABLE 1-3-continued

147	H	m-D2	H	H	H
148	H	H	m-D2	H	H
149	m-D2	m-D2	Cz	Cz	H
150	m-D2	Cz	m-D2	Cz	H
151	m-D2	Cz	Cz	m-D2	H
152	Cz	m-D2	m-D2	Cz	H
153	Cz	m-D2	Cz	m-D2	H
154	Cz	Cz	m-D2	m-D2	H
155	m-D2	m-D2	Cz	H	Cz
156	m-D2	Cz	m-D2	H	Cz
157	m-D2	Cz	Cz	H	m-D2
158	Cz	m-D2	m-D2	H	Cz
159	Cz	m-D2	Cz	H	m-D2
160	Cz	Cz	m-D2	H	m-D2
161	m-D2	m-D2	H	Cz	Cz
162	m-D2	Cz	H	m-D2	Cz
163	m-D2	Cz	H	Cz	m-D2
164	Cz	m-D2	H	m-D2	Cz
165	m-D2	m-D2	Cz	H	H
166	m-D2	Cz	m-D2	H	H
167	Cz	m-D2	m-D2	H	H
168	m-D2	m-D2	H	Cz	H
169	m-D2	Cz	H	m-D2	H
170	Cz	m-D2	H	m-D2	H
171	m-D2	H	m-D2	Cz	H
172	m-D2	H	Cz	m-D2	H
173	Cz	H	m-D2	m-D2	H
174	H	m-D2	m-D2	Cz	H
175	H	m-D2	Cz	m-D2	H
176	m-D2	m-D2	H	H	Cz

TABLE 1-4

177	m-D2	Cz	H	H	m-D2
178	Cz	m-D2	H	H	m-D2
179	m-D2	H	m-D2	H	Cz
180	m-D2	H	Cz	H	m-D2
181	m-D2	m-D2	H	H	H
182	m-D2	H	m-D2	H	H
183	H	m-D2	m-D2	H	H
184	m-D2	H	H	m-D2	H
185	H	m-D2	H	m-D2	H
186	m-D2	H	H	H	m-D2
187	m-D2	m-D2	m-D2	Cz	Cz
188	m-D2	m-D2	Cz	m-D2	Cz
189	m-D2	m-D2	Cz	Cz	m-D2
190	m-D2	Cz	m-D2	m-D2	Cz
191	m-D2	Cz	m-D2	Cz	m-D2
192	m-D2	m-D2	m-D2	Cz	H
193	m-D2	m-D2	Cz	m-D2	H
194	m-D2	Cz	m-D2	Cz	H
195	Cz	m-D2	m-D2	m-D2	H
196	m-D2	m-D2	m-D2	H	Cz
197	m-D2	m-D2	Cz	H	m-D2
198	m-D2	Cz	m-D2	H	m-D2
199	Cz	m-D2	m-D2	H	m-D2
200	m-D2	m-D2	H	m-D2	Cz
201	m-D2	m-D2	H	Cz	m-D2
202	m-D2	m-D2	m-D2	H	H
203	m-D2	m-D2	H	m-D2	H
204	m-D2	H	m-D2	m-D2	H
205	H	m-D2	m-D2	m-D2	H
206	m-D2	m-D2	m-D2	m-D2	Cz
207	m-D2	m-D2	m-D2	Cz	m-D2
208	m-D2	m-D2	Cz	m-D2	m-D2
209	m-D2	m-D2	m-D2	m-D2	H
210	m-D2	m-D2	m-D2	H	m-D2
211	m-D2	m-D2	H	m-D2	m-D2
212	m-D2	m-D2	m-D2	m-D2	m-D2
213	m-D3	Cz	Cz	Cz	Cz
214	Cz	m-D3	Cz	Cz	Cz
215	Cz	Cz	m-D3	Cz	Cz
216	m-D3	Cz	Cz	Cz	H
217	Cz	m-D3	Cz	Cz	H
218	Cz	Cz	m-D3	Cz	H
219	Cz	Cz	Cz	m-D3	H
220	m-D3	Cz	Cz	H	Cz

TABLE 1-4-continued

221	Cz	m-D3	Cz	H	Cz
222	Cz	Cz	m-D3	H	Cz
223	Cz	Cz	Cz	H	m-D3
224	m-D3	Cz	H	Cz	Cz
225	Cz	m-D3	H	Cz	Cz
226	m-D3	Cz	Cz	H	H
227	Cz	m-D3	Cz	H	H
228	Cz	Cz	m-D3	H	H
229	m-D3	Cz	H	Cz	H
230	Cz	m-D3	H	Cz	H
231	Cz	Cz	H	m-D3	H
232	m-D3	H	Cz	Cz	H
233	Cz	H	m-D3	Cz	H
234	Cz	H	Cz	m-D3	H
235	H	m-D3	Cz	Cz	H

TABLE 1-5

236	H	Cz	m-D3	Cz	H
237	m-D3	Cz	H	H	Cz
238	Cz	m-D3	H	H	Cz
239	Cz	Cz	H	H	m-D3
240	m-D3	H	Cz	H	Cz
241	Cz	H	m-D3	H	Cz
242	m-D3	Cz	H	H	H
243	Cz	m-D3	H	H	H
244	m-D3	H	Cz	H	H
245	Cz	H	m-D3	H	H
246	H	m-D3	Cz	H	H
247	H	Cz	m-D3	H	H
248	m-D3	H	H	Cz	H
249	Cz	H	H	m-D3	H
250	H	m-D3	H	Cz	H
251	m-D3	H	H	H	Cz
252	m-D3	H	H	H	H
253	H	m-D3	H	H	H
254	H	H	m-D3	H	H
255	m-D3	m-D3	Cz	Cz	H
256	m-D3	Cz	m-D3	Cz	H
257	m-D3	Cz	Cz	m-D3	H
258	Cz	m-D3	m-D3	Cz	H
259	Cz	m-D3	Cz	m-D3	H
260	Cz	Cz	m-D3	m-D3	H
261	m-D3	m-D3	Cz	H	Cz
262	m-D3	Cz	m-D3	H	Cz
263	m-D3	Cz	Cz	H	m-D3
264	Cz	m-D3	m-D3	H	Cz
265	Cz	m-D3	Cz	H	m-D3
266	Cz	Cz	m-D3	H	m-D3
267	m-D3	m-D3	H	Cz	Cz
268	m-D3	Cz	H	m-D3	Cz
269	m-D3	Cz	H	Cz	m-D3
270	Cz	m-D3	H	m-D3	Cz
271	m-D3	m-D3	Cz	H	H
272	m-D3	Cz	m-D3	H	H
273	Cz	m-D3	m-D3	H	H
274	m-D3	m-D3	H	Cz	H
275	m-D3	Cz	H	m-D3	H
276	Cz	m-D3	H	m-D3	H
277	m-D3	H	m-D3	Cz	H
278	m-D3	H	Cz	m-D3	H
279	Cz	H	m-D3	m-D3	H
280	H	m-D3	m-D3	Cz	H
281	H	m-D3	Cz	m-D3	H
282	m-D3	m-D3	H	H	Cz
283	m-D3	Cz	H	H	m-D3
284	Cz	m-D3	H	H	m-D3
285	m-D3	H	m-D3	H	Cz
286	m-D3	H	Cz	H	m-D3
287	m-D3	m-D3	H	H	H
288	m-D3	H	m-D3	H	H
289	H	m-D3	m-D3	H	H
290	m-D3	H	H	m-D3	H
291	H	m-D3	H	m-D3	H
292	m-D3	H	H	H	m-D3

TABLE 1-5-continued

293	m-D3	m-D3	m-D3	Cz	Cz
294	m-D3	m-D3	Cz	m-D3	Cz

TABLE 1-6

295	m-D3	m-D3	Cz	Cz	m-D3
296	m-D3	Cz	m-D3	m-D3	Cz
297	m-D3	Cz	m-D3	Cz	m-D3
298	m-D3	m-D3	m-D3	Cz	H
299	m-D3	m-D3	Cz	m-D3	H
300	m-D3	Cz	m-D3	Cz	H
301	Cz	m-D3	m-D3	m-D3	H
302	m-D3	m-D3	m-D3	H	Cz
303	m-D3	m-D3	Cz	H	m-D3
304	m-D3	Cz	m-D3	H	m-D3
305	Cz	m-D3	m-D3	H	m-D3
306	m-D3	m-D3	H	m-D3	Cz
307	m-D3	m-D3	H	Cz	m-D3
308	m-D3	m-D3	m-D3	H	H
309	m-D3	m-D3	H	m-D3	H
310	m-D3	H	m-D3	m-D3	H
311	H	m-D3	m-D3	m-D3	H
312	m-D3	m-D3	m-D3	m-D3	Cz
313	m-D3	m-D3	m-D3	Cz	m-D3
314	m-D3	m-D3	Cz	m-D3	m-D3
315	m-D3	m-D3	m-D3	m-D3	H
316	m-D3	m-D3	m-D3	H	m-D3
317	m-D3	m-D3	H	m-D3	m-D3
318	m-D3	m-D3	m-D3	m-D3	m-D3
319	Cz	Cz	m-D4	Cz	Cz
320	m-D4	Cz	Cz	Cz	H
321	Cz	Cz	Cz	m-D4	H
322	m-D4	Cz	Cz	H	Cz
323	Cz	Cz	m-D4	H	Cz
324	Cz	m-D4	H	Cz	Cz
325	Cz	m-D4	Cz	H	H
326	Cz	Cz	m-D4	H	H
327	H	m-D4	Cz	Cz	H
328	H	Cz	m-D4	Cz	H
329	m-D4	H	Cz	H	Cz
330	Cz	H	m-D4	H	Cz
331	m-D4	Cz	H	H	H
332	H	m-D4	H	Cz	H
333	m-D4	m-D4	Cz	H	Cz
334	m-D4	Cz	m-D4	H	Cz
335	Cz	m-D4	m-D4	H	Cz
336	m-D4	m-D4	H	Cz	Cz
337	Cz	m-D4	H	m-D4	Cz
338	m-D4	Cz	m-D4	H	H
339	H	m-D4	m-D4	Cz	H
340	H	m-D4	Cz	m-D4	H
341	m-D4	H	m-D4	H	Cz
342	m-D4	H	Cz	H	m-D4
343	H	m-D4	m-D4	H	H
344	m-D4	Cz	m-D4	Cz	m-D4
345	m-D4	m-D4	m-D4	Cz	H
346	m-D4	m-D4	Cz	m-D4	H
347	m-D4	m-D4	m-D4	H	Cz
348	m-D4	m-D4	H	m-D4	Cz
349	m-D4	m-D4	H	Cz	m-D4
350	m-D4	m-D4	H	m-D4	H
351	H	m-D4	m-D4	m-D4	H
352	m-D4	m-D4	m-D4	m-D4	Cz
353	m-D4	m-D4	m-D4	m-D4	H

TABLE 1-7

354	m-D4	m-D4	H	m-D4	m-D4
355	m-D4	m-D4	m-D4	m-D4	m-D4
356	Cz	Cz	m-D5	Cz	Cz
357	m-D5	Cz	Cz	Cz	H
358	Cz	Cz	Cz	m-D5	H
359	m-D5	Cz	Cz	H	Cz
360	Cz	Cz	m-D5	H	Cz
361	Cz	m-D5	H	Cz	Cz

TABLE 1-7-continued

362	Cz	m-D5	Cz	H	H
363	Cz	Cz	m-D5	H	H
364	H	m-D5	Cz	Cz	H
365	H	Cz	m-D5	Cz	H
366	m-D5	H	Cz	H	Cz
367	Cz	H	m-D5	H	Cz
368	m-D5	Cz	H	H	H
369	H	m-D5	H	Cz	H
370	m-D5	m-D5	Cz	H	Cz
371	m-D5	Cz	m-D5	H	Cz
372	Cz	m-D5	m-D5	H	Cz
373	m-D5	m-D5	H	Cz	Cz
374	Cz	m-D5	H	m-D5	Cz
375	m-D5	Cz	m-D5	H	H
376	H	m-D5	m-D5	Cz	H
377	H	m-D5	Cz	m-D5	H
378	m-D5	H	m-D5	H	Cz
379	m-D5	H	Cz	H	m-D5
380	H	m-D5	m-D5	H	H
381	m-D5	Cz	m-D5	Cz	m-D5
382	m-D5	m-D5	m-D5	Cz	H
383	m-D5	m-D5	Cz	m-D5	H
384	m-D5	m-D5	m-D5	H	Cz
385	m-D5	m-D5	H	m-D5	Cz
386	m-D5	m-D5	H	Cz	m-D5
387	m-D5	m-D5	H	m-D5	H
388	H	m-D5	m-D5	m-D5	H
389	m-D5	m-D5	m-D5	m-D5	Cz
390	m-D5	m-D5	m-D5	m-D5	H
391	m-D5	m-D5	H	m-D5	m-D5
392	m-D5	m-D5	m-D5	m-D5	m-D5
393	Cz	Cz	m-D6	Cz	Cz
394	m-D6	Cz	Cz	Cz	H
395	Cz	Cz	Cz	m-D6	H
396	m-D6	Cz	Cz	H	Cz
397	Cz	Cz	m-D6	H	Cz
398	Cz	m-D6	H	Cz	Cz
399	Cz	m-D6	Cz	H	H
400	Cz	Cz	m-D6	H	H
401	H	m-D6	Cz	Cz	H
402	H	Cz	m-D6	Cz	H
403	m-D6	H	Cz	H	Cz
404	Cz	H	m-D6	H	Cz
405	m-D6	Cz	H	H	H
406	H	m-D6	H	Cz	H
407	m-D6	m-D6	Cz	H	Cz
408	m-D6	Cz	m-D6	H	Cz
409	Cz	m-D6	m-D6	H	Cz
410	m-D6	m-D6	H	Cz	Cz
411	Cz	m-D6	H	m-D6	Cz
412	m-D6	Cz	m-D6	H	H

TABLE 1-8

413	H	m-D6	m-D6	Cz	H
414	H	m-D6	Cz	m-D6	H
415	m-D6	H	m-D6	H	Cz
416	m-D6	H	Cz	H	m-D6
417	H	m-D6	m-D6	H	H
418	m-D6	Cz	m-D6	Cz	m-D6
419	m-D6	m-D6	m-D6	Cz	H
420	m-D6	m-D6	Cz	m-D6	H
421	m-D6	m-D6	m-D6	H	Cz
422	m-D6	m-D6	H	m-D6	Cz
423	m-D6	m-D6	H	Cz	m-D6
424	m-D6	m-D6	H	m-D6	H
425	H	m-D6	m-D6	m-D6	H
426	m-D6	m-D6	m-D6	m-D6	Cz
427	m-D6	m-D6	m-D6	m-D6	H
428	m-D6	m-D6	H	m-D6	m-D6
429	m-D6	m-D6	m-D6	m-D6	m-D6
430	Cz	Cz	m-D7	Cz	Cz
431	m-D7	Cz	Cz	Cz	H
432	Cz	Cz	Cz	m-D7	H
433	m-D7	Cz	Cz	H	Cz
434	Cz	Cz	m-D7	H	Cz
435	Cz	m-D7	H	Cz	Cz

TABLE 1-8-continued

436	Cz	m-D7	Cz	H	H
437	Cz	Cz	m-D7	H	H
438	H	m-D7	Cz	Cz	H
439	H	Cz	m-D7	Cz	H
440	m-D7	H	Cz	H	Cz
441	Cz	H	m-D7	H	Cz
442	m-D7	Cz	H	H	H
443	H	m-D7	H	Cz	H
444	m-D7	m-D7	Cz	H	Cz
445	m-D7	Cz	m-D7	H	Cz
446	Cz	m-D7	m-D7	H	Cz
447	m-D7	m-D7	H	Cz	Cz
448	Cz	m-D7	H	m-D7	Cz
449	m-D7	Cz	m-D7	H	H
450	H	m-D7	m-D7	Cz	H
451	H	m-D7	Cz	m-D7	H
452	m-D7	H	m-D7	H	Cz
453	m-D7	H	Cz	H	m-D7
454	H	m-D7	m-D7	H	H
455	m-D7	Cz	m-D7	Cz	m-D7
456	m-D7	m-D7	m-D7	Cz	H
457	m-D7	m-D7	Cz	m-D7	H
458	m-D7	m-D7	m-D7	H	Cz
459	m-D7	m-D7	H	m-D7	Cz
460	m-D7	m-D7	H	Cz	m-D7
461	m-D7	m-D7	H	m-D7	H
462	H	m-D7	m-D7	m-D7	H
463	m-D7	m-D7	m-D7	m-D7	Cz
464	m-D7	m-D7	m-D7	m-D7	H
465	m-D7	m-D7	H	m-D7	m-D7
466	m-D7	m-D7	m-D7	m-D7	m-D7
467	Cz	Cz	m-D8	Cz	Cz
468	m-D8	Cz	Cz	Cz	H
469	Cz	Cz	Cz	m-D8	H
470	m-D8	Cz	Cz	H	Cz
471	Cz	Cz	m-D8	H	Cz

TABLE 1-9

472	Cz	m-D8	H	Cz	Cz
473	Cz	m-D8	Cz	H	H
474	Cz	Cz	m-D8	H	H
475	H	m-D8	Cz	Cz	H
476	H	Cz	m-D8	Cz	H
477	m-D8	H	Cz	H	Cz
478	Cz	H	m-D8	H	Cz
479	m-D8	Cz	H	H	H
480	H	m-D8	H	Cz	H
481	m-D8	m-D8	Cz	H	Cz
482	m-D8	Cz	m-D8	H	Cz
483	Cz	m-D8	m-D8	H	Cz
484	m-D8	m-D8	H	Cz	Cz
485	Cz	m-D8	H	m-D8	Cz
486	m-D8	Cz	m-D8	H	H
487	H	m-D8	m-D8	Cz	H
488	H	m-D8	Cz	m-D8	H
489	m-D8	H	m-D8	H	Cz
490	m-D8	H	Cz	H	m-D8
491	H	m-D8	m-D8	H	H
492	m-D8	Cz	m-D8	Cz	m-D8
493	m-D8	m-D8	m-D8	Cz	H
494	m-D8	m-D8	Cz	m-D8	H
495	m-D8	m-D8	m-D8	H	Cz
496	m-D8	m-D8	H	m-D8	Cz
497	m-D8	m-D8	H	Cz	m-D8
498	m-D8	m-D8	H	m-D8	H
499	H	m-D8	m-D8	m-D8	H
500	m-D8	m-D8	m-D8	m-D8	Cz
501	m-D8	m-D8	m-D8	m-D8	H
502	m-D8	m-D8	H	m-D8	m-D8
503	m-D8	m-D8	m-D8	m-D8	m-D8
504	Cz	Cz	m-D9	Cz	Cz
505	m-D9	Cz	Cz	Cz	H
506	Cz	Cz	Cz	m-D9	H
507	m-D9	Cz	Cz	H	Cz
508	Cz	Cz	m-D9	H	Cz
509	Cz	m-D9	H	Cz	Cz

TABLE 1-9-continued

510	Cz	m-D9	Cz	H	H
511	Cz	Cz	m-D9	H	H
512	H	m-D9	Cz	Cz	H
513	H	Cz	m-D9	Cz	H
514	m-D9	H	Cz	H	Cz
515	Cz	H	m-D9	H	Cz
516	m-D9	Cz	H	H	H
517	H	m-D9	H	Cz	H
518	m-D9	m-D9	Cz	H	Cz
519	m-D9	Cz	m-D9	H	Cz
520	Cz	m-D9	m-D9	H	Cz
521	m-D9	m-D9	H	Cz	Cz
522	Cz	m-D9	H	m-D9	Cz
523	m-D9	Cz	m-D9	H	H
524	H	m-D9	m-D9	Cz	H
525	H	m-D9	Cz	m-D9	H
526	m-D9	H	m-D9	H	Cz
527	m-D9	H	Cz	H	m-D9
528	H	m-D9	m-D9	H	H
529	m-D9	Cz	m-D9	Cz	m-D9
530	m-D9	m-D9	m-D9	Cz	H

TABLE 1-10

531	m-D9	m-D9	Cz	m-D9	H
532	m-D9	m-D9	m-D9	H	Cz
533	m-D9	m-D9	H	m-D9	Cz
534	m-D9	m-D9	H	Cz	m-D9
535	m-D9	m-D9	H	m-D9	H
536	H	m-D9	m-D9	m-D9	H
537	m-D9	m-D9	m-D9	m-D9	Cz
538	m-D9	m-D9	m-D9	m-D9	H
539	m-D9	m-D9	H	m-D9	m-D9
540	m-D9	m-D9	m-D9	m-D9	m-D9

TABLE 1-11

No	R^1	R^2	R^3	R^4	R^5
541	m-D1	Cz1	Cz1	Cz1	Cz1
542	Cz1	m-D1	Cz1	Cz1	Cz1
543	Cz1	Cz1	m-D1	Cz1	Cz1
544	m-D1	Cz1	Cz1	Cz1	H
545	Cz1	m-D1	Cz1	Cz1	H
546	Cz1	Cz1	m-D1	Cz1	H
547	Cz1	Cz1	Cz1	m-D1	H
548	m-D1	Cz1	Cz1	H	Cz1
549	Cz1	m-D1	Cz1	H	Cz1
550	Cz1	Cz1	m-D1	H	Cz1
551	Cz1	Cz1	Cz1	H	m-D1
552	m-D1	Cz1	H	Cz1	Cz1
553	Cz1	m-D1	H	Cz1	Cz1
554	m-D1	Cz1	Cz1	H	H
555	Cz1	m-D1	Cz1	H	H
556	Cz1	Cz1	m-D1	H	H
557	m-D1	Cz1	H	Cz1	H
558	Cz1	m-D1	H	Cz1	H
559	Cz1	Cz1	H	m-D1	H
560	m-D1	H	Cz1	Cz1	H
561	Cz1	H	m-D1	Cz1	H
562	Cz1	H	Cz1	m-D1	H
563	H	m-D1	Cz1	Cz1	H
564	H	Cz1	m-D1	Cz1	H
565	m-D1	Cz1	H	H	Cz1
566	Cz1	m-D1	H	H	Cz1
567	Cz1	Cz1	H	H	m-D1
568	m-D1	H	Cz1	H	Cz1
569	Cz1	H	m-D1	H	Cz1
570	m-D1	Cz1	H	H	H
571	Cz1	m-D1	H	H	H
572	m-D1	H	Cz1	H	H
573	Cz1	H	m-D1	H	H
574	H	m-D1	Cz1	H	H
575	H	Cz1	m-D1	H	H
576	m-D1	H	H	Cz1	H

TABLE 1-11-continued

No	R^1	R^2	R^3	R^4	R^5
577	Cz1	H	H	m-D1	H
578	H	m-D1	H	Cz1	H
579	m-D1	H	H	H	Cz1
580	m-D1	m-D1	Cz1	Cz1	H
581	m-D1	Cz1	m-D1	Cz1	H
582	m-D1	Cz1	Cz1	m-D1	H
583	Cz1	m-D1	m-D1	Cz1	H
584	Cz1	m-D1	Cz1	m-D1	H
585	Cz1	Cz1	m-D1	m-D1	H
586	m-D1	m-D1	Cz1	H	Cz1
587	m-D1	Cz1	m-D1	H	Cz1
588	m-D1	Cz1	Cz1	H	m-D1
589	Cz1	m-D1	m-D1	H	Cz1
590	Cz1	m-D1	Cz1	H	m-D1
591	Cz1	Cz1	m-D1	H	m-D1
592	m-D1	m-D1	H	Cz1	Cz1
593	m-D1	Cz1	H	m-D1	Cz1
594	m-D1	Cz1	H	Cz1	m-D1
595	Cz1	m-D1	H	m-D1	Cz1
596	m-D1	m-D1	Cz1	H	H
597	m-D1	Cz1	m-D1	H	H
598	Cz1	m-D1	m-D1	H	H

TABLE 1-12

599	m-D1	m-D1	H	Cz1	H
600	m-D1	Cz1	H	m-D1	H
601	Cz1	m-D1	H	m-D1	H
602	m-D1	H	m-D1	Cz1	H
603	m-D1	H	Cz1	m-D1	H
604	Cz1	H	m-D1	m-D1	H
605	H	m-D1	m-D1	Cz1	H
606	H	m-D1	Cz1	m-D1	H
607	m-D1	m-D1	H	H	Cz1
608	m-D1	Cz1	H	H	m-D1
609	Cz1	m-D1	H	H	m-D1
610	m-D1	H	m-D1	H	Cz1
611	m-D1	H	Cz1	H	m-D1
612	m-D1	m-D1	m-D1	Cz1	Cz1
613	m-D1	m-D1	Cz1	m-D1	Cz1
614	m-D1	m-D1	Cz1	Cz1	m-D1
615	m-D1	Cz1	m-D1	m-D1	Cz1
616	m-D1	Cz1	m-D1	Cz1	m-D1
617	m-D1	m-D1	m-D1	Cz1	H
618	m-D1	m-D1	Cz1	m-D1	H
619	m-D1	Cz1	m-D1	Cz1	H
620	Cz1	m-D1	m-D1	m-D1	H
621	m-D1	m-D1	m-D1	H	Cz1
622	m-D1	m-D1	Cz1	H	m-D1
623	m-D1	Cz1	m-D1	H	m-D1
624	Cz1	m-D1	m-D1	H	m-D1
625	m-D1	m-D1	H	m-D1	Cz1
626	m-D1	m-D1	H	Cz1	m-D1
627	m-D1	m-D1	m-D1	m-D1	Cz1
628	m-D1	m-D1	m-D1	Cz1	m-D1
629	m-D1	m-D1	Cz1	m-D1	m-D1
630	m-D2	Cz1	Cz1	Cz1	Cz1
631	Cz1	m-D2	Cz1	Cz1	Cz1
632	Cz1	Cz1	m-D2	Cz1	Cz1
633	m-D2	Cz1	Cz1	Cz1	H
634	Cz1	m-D2	Cz1	Cz1	H
635	Cz1	Cz1	m-D2	Cz1	H
636	Cz1	Cz1	Cz1	m-D2	H
637	m-D2	Cz1	Cz1	H	Cz1
638	Cz1	m-D2	Cz1	H	Cz1
639	Cz1	Cz1	m-D2	H	Cz1
640	Cz1	Cz1	Cz1	H	m-D2
641	m-D2	Cz1	H	Cz1	Cz1
642	Cz1	m-D2	H	Cz1	Cz1
643	m-D2	Cz1	Cz1	H	H
644	Cz1	m-D2	Cz1	H	H
645	Cz1	Cz1	m-D2	H	H
646	m-D2	Cz1	H	Cz1	H
647	Cz1	m-D2	H	Cz1	H
648	Cz1	Cz1	H	m-D2	H

TABLE 1-12-continued

649	m-D2	H	Cz1	Cz1	H
650	Cz1	H	m-D2	Cz1	H
651	Cz1	H	Cz1	m-D2	H
652	H	m-D2	Cz1	Cz1	H
653	H	Cz1	m-D2	Cz1	H
654	m-D2	Cz1	H	H	Cz1
655	Cz1	m-D2	H	H	Cz1
656	Cz1	Cz1	H	H	m-D2
657	m-D2	H	Cz1	H	Cz1

TABLE 1-13

658	Cz1	H	m-D2	H	Cz1
659	m-D2	Cz1	H	H	H
660	Cz1	m-D2	H	H	H
661	m-D2	H	Cz1	H	H
662	Cz1	H	m-D2	H	H
663	H	m-D2	Cz1	H	H
664	H	Cz1	m-D2	H	H
665	m-D2	H	H	Cz1	H
666	Cz1	H	H	m-D2	H
667	H	m-D2	H	Cz1	H
668	m-D2	H	H	H	Cz1
669	m-D2	m-D2	Cz1	Cz1	H
670	m-D2	Cz1	m-D2	Cz1	H
671	m-D2	Cz1	Cz1	m-D2	H
672	Cz1	m-D2	m-D2	Cz1	H
673	Cz1	m-D2	Cz1	m-D2	H
674	Cz1	Cz1	m-D2	m-D2	H
675	m-D2	m-D2	Cz1	H	Cz1
676	m-D2	Cz1	m-D2	H	Cz1
677	m-D2	Cz1	Cz1	H	m-D2
678	Cz1	m-D2	m-D2	H	Cz1
679	Cz1	m-D2	Cz1	H	m-D2
680	Cz1	Cz1	m-D2	H	m-D2
681	m-D2	m-D2	H	Cz1	Cz1
682	m-D2	Cz1	H	m-D2	Cz1
683	m-D2	Cz1	H	Cz1	m-D2
684	Cz1	m-D2	H	m-D2	Cz1
685	m-D2	m-D2	Cz1	H	H
686	m-D2	Cz1	m-D2	H	H
687	Cz1	m-D2	m-D2	H	H
688	m-D2	m-D2	H	Cz1	H
689	m-D2	Cz1	H	m-D2	H
690	Cz1	m-D2	H	m-D2	H
691	m-D2	H	m-D2	Cz1	H
692	m-D2	H	Cz1	m-D2	H
693	Cz1	H	m-D2	m-D2	H
694	H	m-D2	m-D2	Cz1	H
695	H	m-D2	Cz1	m-D2	H
696	m-D2	m-D2	H	H	Cz1
697	m-D2	Cz1	H	H	m-D2
698	Cz1	m-D2	H	H	m-D2
699	m-D2	H	m-D2	H	Cz1
700	m-D2	H	Cz1	H	m-D2
701	m-D2	m-D2	m-D2	Cz1	Cz1
702	m-D2	m-D2	Cz1	m-D2	Cz1
703	m-D2	m-D2	Cz1	Cz1	m-D2
704	m-D2	Cz1	m-D2	m-D2	Cz1
705	m-D2	Cz1	m-D2	Cz1	m-D2
706	m-D2	m-D2	m-D2	Cz1	H
707	m-D2	m-D2	Cz1	m-D2	H
708	m-D2	Cz1	m-D2	Cz1	H
709	Cz1	m-D2	m-D2	m-D2	H
710	m-D2	m-D2	m-D2	H	Cz1
711	m-D2	m-D2	Cz1	H	m-D2
712	m-D2	Cz1	m-D2	H	m-D2
713	Cz1	m-D2	m-D2	H	m-D2
714	m-D2	m-D2	H	m-D2	Cz1
715	m-D2	m-D2	H	Cz1	m-D2
716	m-D2	m-D2	m-D2	m-D2	Cz1

TABLE 1-14

717	m-D2	m-D2	m-D2	Cz1	m-D2
718	m-D2	m-D2	Cz1	m-D2	m-D2
719	m-D3	Cz1	Cz1	Cz1	Cz1
720	Cz1	m-D3	Cz1	Cz1	Cz1
721	Cz1	Cz1	m-D3	Cz1	Cz1
722	m-D3	Cz1	Cz1	Cz1	H
723	Cz1	m-D3	Cz1	Cz1	H
724	Cz1	Cz1	m-D3	Cz1	H
725	Cz1	Cz1	Cz1	m-D3	H
726	m-D3	Cz1	Cz1	H	Cz1
727	Cz1	m-D3	Cz1	H	Cz1
728	Cz1	Cz1	m-D3	H	Cz1
729	Cz1	Cz1	Cz1	H	m-D3
730	m-D3	Cz1	H	Cz1	Cz1
731	Cz1	m-D3	H	Cz1	Cz1
732	m-D3	Cz1	Cz1	H	H
733	Cz1	m-D3	Cz1	H	H
734	Cz1	Cz1	m-D3	H	H
735	m-D3	Cz1	H	Cz1	H
736	Cz1	m-D3	H	Cz1	H
737	Cz1	Cz1	H	m-D3	H
738	m-D3	H	Cz1	Cz1	H
739	Cz1	H	m-D3	Cz1	H
740	Cz1	H	Cz1	m-D3	H
741	H	m-D3	Cz1	Cz1	H
742	H	Cz1	m-D3	Cz1	H
743	m-D3	Cz1	H	H	Cz1
744	Cz1	m-D3	H	H	Cz1
745	Cz1	Cz1	H	H	m-D3
746	m-D3	H	Cz1	H	Cz1
747	Cz1	H	m-D3	H	Cz1
748	m-D3	Cz1	H	H	H
749	Cz1	m-D3	H	H	H
750	m-D3	H	Cz1	H	H
751	Cz1	H	m-D3	H	H
752	H	m-D3	Cz1	H	H
753	H	Cz1	m-D3	H	H
754	m-D3	H	H	Cz1	H
755	Cz1	H	H	m-D3	H
756	H	m-D3	H	Cz1	H
757	m-D3	H	H	H	Cz1
758	m-D3	m-D3	Cz1	Cz1	H
759	m-D3	Cz1	m-D3	Cz1	H
760	m-D3	Cz1	Cz1	m-D3	H
761	Cz1	m-D3	m-D3	Cz1	H
762	Cz1	m-D3	Cz1	m-D3	H
763	Cz1	Cz1	m-D3	m-D3	H
764	m-D3	m-D3	Cz1	H	Cz1
765	m-D3	Cz1	m-D3	H	Cz1
766	m-D3	Cz1	Cz1	H	m-D3
767	Cz1	m-D3	m-D3	H	Cz1
768	Cz1	m-D3	Cz1	H	m-D3
769	Cz1	Cz1	m-D3	H	m-D3
770	m-D3	m-D3	H	Cz1	Cz1
771	m-D3	Cz1	H	m-D3	Cz1
772	m-D3	Cz1	H	Cz1	m-D3
773	Cz1	m-D3	H	m-D3	Cz1
774	m-D3	m-D3	Cz1	H	H
775	m-D3	Cz1	m-D3	H	H

TABLE 1-15

776	Cz1	m-D3	m-D3	H	H
777	m-D3	m-D3	H	Cz1	H
778	m-D3	Cz1	H	m-D3	H
779	Cz1	m-D3	H	m-D3	H
780	m-D3	H	m-D3	Cz1	H
781	m-D3	H	Cz1	m-D3	H
782	Cz1	H	m-D3	m-D3	H
783	H	m-D3	m-D3	Cz1	H
784	H	m-D3	Cz1	m-D3	H
785	m-D3	m-D3	H	H	Cz1
786	m-D3	Cz1	H	H	m-D3
787	Cz1	m-D3	H	H	m-D3
788	m-D3	H	m-D3	H	Cz1
789	m-D3	H	Cz1	H	m-D3
790	m-D3	m-D3	m-D3	Cz1	Cz1

TABLE 1-15-continued

791	m-D3	m-D3	Cz1	m-D3	Cz1
792	m-D3	m-D3	Cz1	Cz1	m-D3
793	m-D3	Cz1	m-D3	m-D3	Cz1
794	m-D3	Cz1	m-D3	Cz1	m-D3
795	m-D3	m-D3	m-D3	Cz1	H
796	m-D3	m-D3	Cz1	m-D3	H
797	m-D3	Cz1	m-D3	Cz1	H
798	Cz1	m-D3	m-D3	m-D3	H
799	m-D3	m-D3	m-D3	H	Cz1
800	m-D3	m-D3	Cz1	H	m-D3
801	m-D3	Cz1	m-D3	H	m-D3
802	Cz1	m-D3	m-D3	H	m-D3
803	m-D3	m-D3	H	m-D3	Cz1
804	m-D3	m-D3	H	Cz1	m-D3
805	m-D3	m-D3	m-D3	m-D3	Cz1
806	m-D3	m-D3	m-D3	Cz1	m-D3
807	m-D3	m-D3	Cz1	m-D3	m-D3
808	m-D1	Cz2	Cz2	Cz2	Cz2
809	Cz2	m-D1	Cz2	Cz2	Cz2
810	Cz2	Cz2	m-D1	Cz2	Cz2
811	m-D1	Cz2	Cz2	Cz2	H
812	Cz2	m-D1	Cz2	Cz2	H
813	Cz2	Cz2	m-D1	Cz2	H
814	Cz2	Cz2	Cz2	m-D1	H
815	m-D1	Cz2	Cz2	H	Cz2
816	Cz2	m-D1	Cz2	H	Cz2
817	Cz2	Cz2	m-D1	H	Cz2
818	Cz2	Cz2	Cz2	H	m-D1
819	m-D1	Cz2	H	Cz2	Cz2
820	Cz2	m-D1	H	Cz2	Cz2
821	m-D1	Cz2	Cz2	H	H
822	Cz2	m-D1	Cz2	H	H
823	Cz2	Cz2	m-D1	H	H
824	m-D1	Cz2	H	Cz2	H
825	Cz2	m-D1	H	Cz2	H
826	Cz2	Cz2	H	m-D1	H
827	m-D1	H	Cz2	Cz2	H
828	Cz2	H	m-D1	Cz2	H
829	Cz2	H	Cz2	m-D1	H
830	H	m-D1	Cz2	Cz2	H
831	H	Cz2	m-D1	Cz2	H
832	m-D1	Cz2	H	H	Cz2
833	Cz2	m-D1	H	H	Cz2
834	Cz2	Cz2	H	H	m-D1

TABLE 1-16

835	m-D1	H	Cz2	H	Cz2
836	Cz2	H	m-D1	H	Cz2
837	m-D1	Cz2	H	H	H
838	Cz2	m-D1	H	H	H
839	m-D1	H	Cz2	H	H
840	Cz2	H	m-D1	H	H
841	H	m-D1	Cz2	H	H
842	H	Cz2	m-D1	H	H
843	m-D1	H	H	Cz2	H
844	Cz2	H	H	m-D1	H
845	H	m-D1	H	Cz2	H
846	m-D1	H	H	H	Cz2
847	m-D1	m-D1	Cz2	Cz2	H
848	m-D1	Cz2	m-D1	Cz2	H
849	m-D1	Cz2	Cz2	m-D1	H
850	Cz2	m-D1	m-D1	Cz2	H
851	Cz2	m-D1	Cz2	m-D1	H
852	Cz2	Cz2	m-D1	m-D1	H
853	m-D1	m-D1	Cz2	H	Cz2
854	m-D1	Cz2	m-D1	H	Cz2
855	m-D1	Cz2	Cz2	H	m-D1
856	Cz2	m-D1	m-D1	H	Cz2
857	Cz2	m-D1	Cz2	H	m-D1
858	Cz2	Cz2	m-D1	H	m-D1
859	m-D1	m-D1	H	Cz2	Cz2
860	m-D1	Cz2	H	m-D1	Cz2
861	m-D1	Cz2	H	Cz2	m-D1
862	Cz2	m-D1	H	m-D1	Cz2
863	m-D1	m-D1	Cz2	H	H
864	m-D1	Cz2	m-D1	H	H

TABLE 1-16-continued

865	Cz2	m-D1	m-D1	H	H
866	m-D1	m-D1	H	Cz2	H
867	m-D1	Cz2	H	m-D1	H
868	Cz2	m-D1	H	m-D1	H
869	m-D1	H	m-D1	Cz2	H
870	m-D1	H	Cz2	m-D1	H
871	Cz2	H	m-D1	m-D1	H
872	H	m-D1	m-D1	Cz2	H
873	H	m-D1	Cz2	m-D1	H
874	m-D1	m-D1	H	H	Cz2
875	m-D1	Cz2	H	H	m-D1
876	Cz2	m-D1	H	H	m-D1
877	m-D1	H	m-D1	H	Cz2
878	m-D1	H	Cz2	H	m-D1
879	m-D1	m-D1	m-D1	Cz2	Cz2
880	m-D1	m-D1	Cz2	m-D1	Cz2
881	m-D1	m-D1	Cz2	Cz2	m-D1
882	m-D1	Cz2	m-D1	m-D1	Cz2
883	m-D1	Cz2	m-D1	Cz2	m-D1
884	m-D1	m-D1	m-D1	Cz2	H
885	m-D1	m-D1	Cz2	m-D1	H
886	m-D1	Cz2	m-D1	Cz2	H
887	Cz2	m-D1	m-D1	m-D1	H
888	m-D1	m-D1	m-D1	H	Cz2
889	m-D1	m-D1	Cz2	H	m-D1
890	m-D1	Cz2	m-D1	H	m-D1
891	Cz2	m-D1	m-D1	H	m-D1
892	m-D1	m-D1	H	m-D1	Cz2
893	m-D1	m-D1	H	Cz2	m-D1

TABLE 1-17

894	m-D1	m-D1	m-D1	m-D1	Cz2
895	m-D1	m-D1	m-D1	Cz2	m-D1
896	m-D1	m-D1	Cz2	m-D1	m-D1
897	m-D2	Cz2	Cz2	Cz2	Cz2
898	Cz2	m-D2	Cz2	Cz2	Cz2
899	Cz2	Cz2	m-D2	Cz2	Cz2
900	m-D2	Cz2	Cz2	Cz2	H
901	Cz2	m-D2	Cz2	Cz2	H
902	Cz2	Cz2	m-D2	Cz2	H
903	Cz2	Cz2	Cz2	m-D2	H
904	m-D2	Cz2	Cz2	H	Cz2
905	Cz2	m-D2	Cz2	H	Cz2
906	Cz2	Cz2	m-D2	H	Cz2
907	Cz2	Cz2	Cz2	H	m-D2
908	m-D2	Cz2	H	Cz2	Cz2
909	Cz2	m-D2	H	Cz2	Cz2
910	m-D2	Cz2	Cz2	H	H
911	Cz2	m-D2	Cz2	H	H
912	Cz2	Cz2	m-D2	H	H
913	m-D2	Cz2	H	Cz2	H
914	Cz2	m-D2	H	Cz2	H
915	Cz2	Cz2	H	m-D2	H
916	m-D2	H	Cz2	Cz2	H
917	Cz2	H	m-D2	Cz2	H
918	Cz2	H	Cz2	m-D2	H
919	H	m-D2	Cz2	Cz2	H
920	H	Cz2	m-D2	Cz2	H
921	m-D2	Cz2	H	H	Cz2
922	Cz2	m-D2	H	H	Cz2
923	Cz2	Cz2	H	H	m-D2
924	m-D2	H	Cz2	H	Cz2
925	Cz2	H	m-D2	H	Cz2
926	m-D2	Cz2	H	H	H
927	Cz2	m-D2	H	H	H
928	m-D2	H	Cz2	H	H
929	Cz2	H	m-D2	H	H
930	H	m-D2	Cz2	H	H
931	H	Cz2	m-D2	H	H
932	m-D2	H	H	Cz2	H
933	Cz2	H	H	m-D2	H
934	H	m-D2	H	Cz2	H
935	m-D2	H	H	H	Cz2
936	m-D2	m-D2	Cz2	Cz2	H
937	m-D2	Cz2	m-D2	Cz2	H
938	m-D2	Cz2	Cz2	m-D2	H

TABLE 1-17-continued

939	Cz2	m-D2	m-D2	Cz2	H
940	Cz2	m-D2	Cz2	m-D2	H
941	Cz2	Cz2	m-D2	m-D2	H
942	m-D2	m-D2	Cz2	H	Cz2
943	m-D2	Cz2	m-D2	H	Cz2
944	m-D2	Cz2	Cz2	H	m-D2
945	Cz2	m-D2	m-D2	H	Cz2
946	Cz2	m-D2	Cz2	H	m-D2
947	Cz2	Cz2	m-D2	H	m-D2
948	m-D2	m-D2	H	Cz2	Cz2
949	m-D2	Cz2	H	m-D2	Cz2
950	m-D2	Cz2	H	Cz2	m-D2
951	Cz2	m-D2	H	m-D2	Cz2
952	m-D2	m-D2	Cz2	H	H

TABLE 1-18

953	m-D2	Cz2	m-D2	H	H
954	Cz2	m-D2	m-D2	H	H
955	m-D2	m-D2	H	Cz2	H
956	m-D2	Cz2	H	m-D2	H
957	Cz2	m-D2	H	m-D2	H
958	m-D2	H	m-D2	Cz2	H
959	m-D2	H	Cz2	m-D2	H
960	Cz2	H	m-D2	m-D2	H
961	H	m-D2	m-D2	Cz2	H
962	H	m-D2	Cz2	m-D2	H
963	m-D2	m-D2	H	H	Cz2
964	m-D2	Cz2	H	H	m-D2
965	Cz2	m-D2	H	H	m-D2
966	m-D2	H	m-D2	H	Cz2
967	m-D2	H	Cz2	H	m-D2
968	m-D2	m-D2	m-D2	Cz2	Cz2
969	m-D2	m-D2	Cz2	m-D2	Cz2
970	m-D2	m-D2	Cz2	Cz2	m-D2
971	m-D2	Cz2	m-D2	m-D2	Cz2
972	m-D2	Cz2	m-D2	Cz2	m-D2
973	m-D2	m-D2	m-D2	Cz2	H
974	m-D2	m-D2	Cz2	m-D2	H
975	m-D2	Cz2	m-D2	Cz2	H
976	Cz2	m-D2	m-D2	m-D2	H
977	m-D2	m-D2	m-D2	H	Cz2
978	m-D2	m-D2	Cz2	H	m-D2
979	m-D2	Cz2	m-D2	H	m-D2
980	Cz2	m-D2	m-D2	H	m-D2
981	m-D2	m-D2	H	m-D2	Cz2
982	m-D2	m-D2	H	Cz2	m-D2
983	m-D2	m-D2	m-D2	m-D2	Cz2
984	m-D2	m-D2	m-D2	Cz2	m-D2
985	m-D2	m-D2	Cz2	m-D2	m-D2
986	m-D3	Cz2	Cz2	Cz2	Cz2
987	Cz2	m-D3	Cz2	Cz2	Cz2
988	Cz2	Cz2	m-D3	Cz2	Cz2
989	m-D3	Cz2	Cz2	Cz2	H
990	Cz2	m-D3	Cz2	Cz2	H
991	Cz2	Cz2	m-D3	Cz2	H
992	Cz2	Cz2	Cz2	m-D3	H
993	m-D3	Cz2	Cz2	H	Cz2
994	Cz2	m-D3	Cz2	H	Cz2
995	Cz2	Cz2	m-D3	H	Cz2
996	Cz2	Cz2	Cz2	H	m-D3
997	m-D3	Cz2	H	Cz2	Cz2
998	Cz2	m-D3	H	Cz2	Cz2
999	m-D3	Cz2	Cz2	H	H
1000	Cz2	m-D3	Cz2	H	H
1001	Cz2	Cz2	m-D3	H	H
1002	m-D3	Cz2	H	Cz2	H
1003	Cz2	m-D3	H	Cz2	H
1004	Cz2	Cz2	H	m-D3	H
1005	m-D3	H	Cz2	Cz2	H
1006	Cz2	H	m-D3	Cz2	H
1007	Cz2	H	Cz2	m-D3	H
1008	H	m-D3	Cz2	Cz2	H
1009	H	Cz2	m-D3	Cz2	H
1010	m-D3	Cz2	H	H	Cz2
1011	Cz2	m-D3	H	H	Cz2

TABLE 1-19

1012	Cz2	Cz2	H	H	m-D3
1013	m-D3	H	Cz2	H	Cz2
1014	Cz2	H	m-D3	H	Cz2
1015	m-D3	Cz2	H	H	H
1016	Cz2	m-D3	H	H	H
1017	m-D3	H	Cz2	H	H
1018	Cz2	H	m-D3	H	H
1019	H	m-D3	Cz2	H	H
1020	H	Cz2	m-D3	H	H
1021	m-D3	H	H	Cz2	H
1022	Cz2	H	H	m-D3	H
1023	H	m-D3	H	Cz2	H
1024	m-D3	H	H	H	Cz2
1025	m-D3	m-D3	Cz2	Cz2	H
1026	m-D3	Cz2	m-D3	Cz2	H
1027	m-D3	Cz2	Cz2	m-D3	H
1028	Cz2	m-D3	m-D3	Cz2	H
1029	Cz2	m-D3	Cz2	m-D3	H
1030	Cz2	Cz2	m-D3	m-D3	H
1031	m-D3	m-D3	Cz2	H	Cz2
1032	m-D3	Cz2	m-D3	H	Cz2
1033	m-D3	Cz2	Cz2	H	m-D3
1034	Cz2	m-D3	m-D3	H	Cz2
1035	Cz2	m-D3	Cz2	H	m-D3
1036	Cz2	Cz2	m-D3	H	m-D3
1037	m-D3	m-D3	H	Cz2	Cz2
1038	m-D3	Cz2	H	m-D3	Cz2
1039	m-D3	Cz2	H	Cz2	m-D3
1040	Cz2	m-D3	H	m-D3	Cz2
1041	m-D3	m-D3	Cz2	H	H
1042	m-D3	Cz2	m-D3	H	H
1043	Cz2	m-D3	m-D3	H	H
1044	m-D3	m-D3	H	Cz2	H
1045	m-D3	Cz2	H	m-D3	H
1046	Cz2	m-D3	H	m-D3	H
1047	m-D3	H	m-D3	Cz2	H
1048	m-D3	H	Cz2	m-D3	H
1049	Cz2	H	m-D3	m-D3	H
1050	H	m-D3	m-D3	Cz2	H
1051	H	m-D3	Cz2	m-D3	H
1052	m-D3	m-D3	H	H	Cz2
1053	m-D3	Cz2	H	H	m-D3
1054	Cz2	m-D3	H	H	m-D3
1055	m-D3	H	m-D3	H	Cz2
1056	m-D3	H	Cz2	H	m-D3
1057	m-D3	m-D3	m-D3	Cz2	Cz2
1058	m-D3	m-D3	Cz2	m-D3	Cz2
1059	m-D3	m-D3	Cz2	Cz2	m-D3
1060	m-D3	Cz2	m-D3	m-D3	Cz2
1061	m-D3	Cz2	m-D3	Cz2	m-D3
1062	m-D3	m-D3	m-D3	Cz2	H
1063	m-D3	m-D3	Cz2	m-D3	H
1064	m-D3	Cz2	m-D3	Cz2	H
1065	Cz2	m-D3	m-D3	m-D3	H
1066	m-D3	m-D3	m-D3	H	Cz2
1067	m-D3	m-D3	Cz2	H	m-D3
1068	m-D3	Cz2	m-D3	H	m-D3
1069	Cz2	m-D3	m-D3	H	m-D3
1070	m-D3	m-D3	H	m-D3	Cz2

TABLE 1-20

1071	m-D3	m-D3	H	Cz2	m-D3
1072	m-D3	m-D3	m-D3	m-D3	Cz2
1073	m-D3	m-D3	m-D3	Cz2	m-D3
1074	m-D3	m-D3	Cz2	m-D3	m-D3
1075	m-D1	Cz3	Cz3	Cz3	Cz3
1076	Cz3	m-D1	Cz3	Cz3	Cz3
1077	Cz3	Cz3	m-D1	Cz3	Cz3
1078	m-D1	Cz3	Cz3	Cz3	H
1079	Cz3	m-D1	Cz3	Cz3	H
1080	Cz3	Cz3	m-D1	Cz3	H
1081	Cz3	Cz3	Cz3	m-D1	H
1082	m-D1	Cz3	Cz3	H	Cz3
1083	Cz3	m-D1	Cz3	H	Cz3
1084	Cz3	Cz3	m-D1	H	Cz3
1085	Cz3	Cz3	Cz3	H	m-D1

TABLE 1-20-continued

1086	m-D1	Cz3	H	Cz3	Cz3
1087	Cz3	m-D1	H	Cz3	Cz3
1088	m-D1	Cz3	Cz3	H	H
1089	Cz3	m-D1	Cz3	H	H
1090	Cz3	Cz3	m-D1	H	H
1091	m-D1	Cz3	H	Cz3	H
1092	Cz3	m-D1	H	Cz3	H
1093	Cz3	Cz3	H	m-D1	H
1094	m-D1	H	Cz3	Cz3	H
1095	Cz3	H	m-D1	Cz3	H
1096	Cz3	H	Cz3	m-D1	H
1097	H	m-D1	Cz3	Cz3	H
1098	H	Cz3	m-D1	Cz3	H
1099	m-D1	Cz3	H	H	Cz3
1100	Cz3	m-D1	H	H	Cz3
1101	Cz3	Cz3	H	H	m-D1
1102	m-D1	H	Cz3	H	Cz3
1103	Cz3	H	m-D1	H	Cz3
1104	m-D1	Cz3	H	H	H
1105	Cz3	m-D1	H	H	H
1106	m-D1	H	Cz3	H	H
1107	Cz3	H	m-D1	H	H
1108	H	m-D1	Cz3	H	H
1109	H	Cz3	m-D1	H	H
1110	m-D1	H	H	Cz3	H
1111	Cz3	H	H	m-D1	H
1112	H	m-D1	H	Cz3	H
1113	m-D1	H	H	H	Cz3
1114	m-D1	m-D1	Cz3	Cz3	H
1115	m-D1	Cz3	m-D1	Cz3	H
1116	m-D1	Cz3	Cz3	m-D1	H
1117	Cz3	m-D1	m-D1	Cz3	H
1118	Cz3	m-D1	Cz3	m-D1	H
1119	Cz3	Cz3	m-D1	m-D1	H
1120	m-D1	m-D1	Cz3	H	Cz3
1121	m-D1	Cz3	m-D1	H	Cz3
1122	m-D1	Cz3	Cz3	H	m-D1
1123	Cz3	m-D1	m-D1	H	Cz3
1124	Cz3	m-D1	Cz3	H	m-D1
1125	Cz3	Cz3	m-D1	H	m-D1
1126	m-D1	m-D1	H	Cz3	Cz3
1127	m-D1	Cz3	H	m-D1	Cz3
1128	m-D1	Cz3	H	Cz3	m-D1
1129	Cz3	m-D1	H	m-D1	Cz3

TABLE 1-21

1130	m-D1	m-D1	Cz3	H	H
1131	m-D1	Cz3	m-D1	H	H
1132	Cz3	m-D1	m-D1	H	H
1133	m-D1	m-D1	H	Cz3	H
1134	m-D1	Cz3	H	m-D1	H
1135	Cz3	m-D1	H	m-D1	H
1136	m-D1	H	m-D1	Cz3	H
1137	m-D1	H	Cz3	m-D1	H
1138	Cz3	H	m-D1	m-D1	H
1139	H	m-D1	m-D1	Cz3	H
1140	H	m-D1	Cz3	m-D1	H
1141	m-D1	m-D1	H	H	Cz3
1142	m-D1	Cz3	H	H	m-D1
1143	Cz3	m-D1	H	H	m-D1
1144	m-D1	H	m-D1	H	Cz3
1145	m-D1	H	Cz3	H	m-D1
1146	m-D1	m-D1	m-D1	Cz3	Cz3
1147	m-D1	m-D1	Cz3	m-D1	Cz3
1148	m-D1	m-D1	Cz3	Cz3	m-D1
1149	m-D1	Cz3	m-D1	m-D1	Cz3
1150	m-D1	Cz3	m-D1	Cz3	m-D1
1151	m-D1	m-D1	m-D1	Cz3	H
1152	m-D1	m-D1	Cz3	m-D1	H
1153	m-D1	Cz3	m-D1	Cz3	H
1154	Cz3	m-D1	m-D1	m-D1	H
1155	m-D1	m-D1	m-D1	H	Cz3
1156	m-D1	m-D1	Cz3	H	m-D1
1157	m-D1	Cz3	m-D1	H	m-D1
1158	Cz3	m-D1	m-D1	H	m-D1
1159	m-D1	m-D1	H	m-D1	Cz3

TABLE 1-21-continued

1160	m-D1	m-D1	H	Cz3	m-D1
1161	m-D1	m-D1	m-D1	m-D1	Cz3
1162	m-D1	m-D1	m-D1	Cz3	m-D1
1163	m-D1	m-D1	Cz3	m-D1	m-D1
1164	m-D2	Cz3	Cz3	Cz3	Cz3
1165	Cz3	m-D2	Cz3	Cz3	Cz3
1166	Cz3	Cz3	m-D2	Cz3	Cz3
1167	m-D2	Cz3	Cz3	Cz3	H
1168	Cz3	m-D2	Cz3	Cz3	H
1169	Cz3	Cz3	m-D2	Cz3	H
1170	Cz3	Cz3	Cz3	m-D2	H
1171	m-D2	Cz3	Cz3	H	Cz3
1172	Cz3	m-D2	Cz3	H	Cz3
1173	Cz3	Cz3	m-D2	H	Cz3
1174	Cz3	Cz3	Cz3	H	m-D2
1175	m-D2	Cz3	H	Cz3	Cz3
1176	Cz3	m-D2	H	Cz3	Cz3
1177	m-D2	Cz3	Cz3	H	H
1178	Cz3	m-D2	Cz3	H	H
1179	Cz3	Cz3	m-D2	H	H
1180	m-D2	Cz3	H	Cz3	H
1181	Cz3	m-D2	H	Cz3	H
1182	Cz3	Cz3	H	m-D2	H
1183	m-D2	H	Cz3	Cz3	H
1184	Cz3	H	m-D2	Cz3	H
1185	Cz3	H	Cz3	m-D2	H
1186	H	m-D2	Cz3	Cz3	H
1187	H	Cz3	m-D2	Cz3	H
1188	m-D2	Cz3	H	H	Cz3

TABLE 1-22

1189	Cz3	m-D2	H	H	Cz3
1190	Cz3	Cz3	H	H	m-D2
1191	m-D2	H	Cz3	H	Cz3
1192	Cz3	H	m-D2	H	Cz3
1193	m-D2	Cz3	H	H	H
1194	Cz3	m-D2	H	H	H
1195	m-D2	H	Cz3	H	H
1196	Cz3	H	m-D2	H	H
1197	H	m-D2	Cz3	H	H
1198	H	Cz3	m-D2	H	H
1199	m-D2	H	H	Cz3	H
1200	Cz3	H	H	m-D2	H
1201	H	m-D2	H	Cz3	H
1202	m-D2	H	H	H	Cz3
1203	m-D2	m-D2	Cz3	Cz3	H
1204	m-D2	Cz3	m-D2	Cz3	H
1205	m-D2	Cz3	Cz3	m-D2	H
1206	Cz3	m-D2	m-D2	Cz3	H
1207	Cz3	m-D2	Cz3	m-D2	H
1208	Cz3	Cz3	m-D2	m-D2	H
1209	m-D2	m-D2	Cz3	H	Cz3
1210	m-D2	Cz3	m-D2	H	Cz3
1211	m-D2	Cz3	Cz3	H	m-D2
1212	Cz3	m-D2	m-D2	H	Cz3
1213	Cz3	m-D2	Cz3	H	m-D2
1214	Cz3	Cz3	m-D2	H	m-D2
1215	m-D2	m-D2	H	Cz3	Cz3
1216	m-D2	Cz3	H	m-D2	Cz3
1217	m-D2	Cz3	H	Cz3	m-D2
1218	Cz3	m-D2	H	m-D2	Cz3
1219	m-D2	m-D2	Cz3	H	H
1220	m-D2	Cz3	m-D2	H	H
1221	Cz3	m-D2	m-D2	H	H
1222	m-D2	m-D2	H	Cz3	H
1223	m-D2	Cz3	H	m-D2	H
1224	Cz3	m-D2	H	m-D2	H
1225	m-D2	H	m-D2	Cz3	H
1226	m-D2	H	Cz3	m-D2	H
1227	Cz3	H	m-D2	m-D2	H
1228	H	m-D2	m-D2	Cz3	H
1229	H	m-D2	Cz3	m-D2	H
1230	m-D2	m-D2	H	H	Cz3
1231	m-D2	Cz3	H	H	m-D2
1232	Cz3	m-D2	H	H	m-D2
1233	m-D2	H	m-D2	H	Cz3

TABLE 1-22-continued

1234	m-D2	H	Cz3	H	m-D2
1235	m-D2	m-D2	m-D2	Cz3	Cz3
1236	m-D2	m-D2	Cz3	m-D2	Cz3
1237	m-D2	m-D2	Cz3	Cz3	m-D2
1238	m-D2	Cz3	m-D2	m-D2	Cz3
1239	m-D2	Cz3	m-D2	Cz3	m-D2
1240	m-D2	m-D2	m-D2	Cz3	H
1241	m-D2	m-D2	Cz3	m-D2	H
1242	m-D2	Cz3	m-D2	Cz3	H
1243	Cz3	m-D2	m-D2	m-D2	H
1244	m-D2	m-D2	m-D2	H	Cz3
1245	m-D2	m-D2	Cz3	H	m-D2
1246	m-D2	Cz3	m-D2	H	m-D2
1247	Cz3	m-D2	m-D2	H	m-D2

TABLE 1-23

1248	m-D2	m-D2	H	m-D2	Cz3
1249	m-D2	m-D2	H	Cz3	m-D2
1250	m-D2	m-D2	m-D2	m-D2	Cz3
1251	m-D2	m-D2	m-D2	Cz3	m-D2
1252	m-D2	m-D2	Cz3	m-D2	m-D2
1253	m-D3	Cz3	Cz3	Cz3	Cz3
1254	Cz3	m-D3	Cz3	Cz3	Cz3
1255	Cz3	Cz3	m-D3	Cz3	Cz3
1256	m-D3	Cz3	Cz3	Cz3	H
1257	Cz3	m-D3	Cz3	Cz3	H
1258	Cz3	Cz3	m-D3	Cz3	H
1259	Cz3	Cz3	Cz3	m-D3	H
1260	m-D3	Cz3	Cz3	H	Cz3
1261	Cz3	m-D3	Cz3	H	Cz3
1262	Cz3	Cz3	m-D3	H	Cz3
1263	Cz3	Cz3	Cz3	H	m-D3
1264	m-D3	Cz3	H	Cz3	Cz3
1265	Cz3	m-D3	H	Cz3	Cz3
1266	m-D3	Cz3	Cz3	H	H
1267	Cz3	m-D3	Cz3	H	H
1268	Cz3	Cz3	m-D3	H	H
1269	m-D3	Cz3	H	Cz3	H
1270	Cz3	m-D3	H	Cz3	H
1271	Cz3	Cz3	H	m-D3	H
1272	m-D3	H	Cz3	Cz3	H
1273	Cz3	H	m-D3	Cz3	H
1274	Cz3	H	Cz3	m-D3	H
1275	H	m-D3	Cz3	Cz3	H
1276	H	Cz3	m-D3	Cz3	H
1277	m-D3	Cz3	H	H	Cz3
1278	Cz3	m-D3	H	H	Cz3
1279	Cz3	Cz3	H	H	m-D3
1280	m-D3	H	Cz3	H	Cz3
1281	Cz3	H	m-D3	H	Cz3
1282	m-D3	Cz3	H	H	H
1283	Cz3	m-D3	H	H	H
1284	m-D3	H	Cz3	H	H
1285	Cz3	H	m-D3	H	H
1286	H	m-D3	Cz3	H	H
1287	H	Cz3	m-D3	H	H
1288	m-D3	H	H	Cz3	H
1289	Cz3	H	H	m-D3	H
1290	H	m-D3	H	Cz3	H
1291	m-D3	H	H	H	Cz3
1292	m-D3	m-D3	Cz3	Cz3	H
1293	m-D3	Cz3	m-D3	Cz3	H
1294	m-D3	Cz3	Cz3	m-D3	H
1295	Cz3	m-D3	m-D3	Cz3	H
1296	Cz3	m-D3	Cz3	m-D3	H
1297	Cz3	Cz3	m-D3	m-D3	H
1298	m-D3	m-D3	Cz3	H	Cz3
1299	m-D3	Cz3	m-D3	H	Cz3
1300	m-D3	Cz3	Cz3	H	m-D3
1301	Cz3	m-D3	m-D3	H	Cz3
1302	Cz3	m-D3	Cz3	H	m-D3
1303	Cz3	Cz3	m-D3	H	m-D3
1304	m-D3	m-D3	H	Cz3	Cz3
1305	m-D3	Cz3	H	m-D3	Cz3
1306	m-D3	Cz3	H	Cz3	m-D3

TABLE 1-24

1307	Cz3	m-D3	H	m-D3	Cz3
1308	m-D3	m-D3	Cz3	H	H
1309	m-D3	Cz3	m-D3	H	H
1310	Cz3	m-D3	m-D3	H	H
1311	m-D3	m-D3	H	Cz3	H
1312	m-D3	Cz3	H	m-D3	H
1313	Cz3	m-D3	H	m-D3	H
1314	m-D3	H	m-D3	Cz3	H
1315	m-D3	H	Cz3	m-D3	H
1316	Cz3	H	m-D3	m-D3	H
1317	H	m-D3	m-D3	Cz3	H
1318	H	m-D3	Cz3	m-D3	H
1319	m-D3	m-D3	H	H	Cz3
1320	m-D3	Cz3	H	H	m-D3
1321	Cz3	m-D3	H	H	m-D3
1322	m-D3	H	m-D3	H	Cz3
1323	m-D3	H	Cz3	H	m-D3
1324	m-D3	m-D3	m-D3	Cz3	Cz3
1325	m-D3	m-D3	Cz3	m-D3	Cz3
1326	m-D3	m-D3	Cz3	Cz3	m-D3
1327	m-D3	Cz3	m-D3	m-D3	Cz3
1328	m-D3	Cz3	m-D3	Cz3	m-D3
1329	m-D3	m-D3	m-D3	Cz3	H
1330	m-D3	m-D3	Cz3	m-D3	H
1331	m-D3	Cz3	m-D3	Cz3	H
1332	Cz3	m-D3	m-D3	m-D3	H
1333	m-D3	m-D3	m-D3	H	Cz3
1334	m-D3	m-D3	Cz3	H	m-D3
1335	m-D3	Cz3	m-D3	H	m-D3
1336	Cz3	m-D3	m-D3	H	m-D3
1337	m-D3	m-D3	H	m-D3	Cz3
1338	m-D3	m-D3	H	Cz3	m-D3
1339	m-D3	m-D3	m-D3	m-D3	Cz3
1340	m-D3	m-D3	m-D3	Cz3	m-D3
1341	m-D3	m-D3	Cz3	m-D3	m-D3

TABLE 1-25

No	R^1	R^2	R^3	R^4	R^5
1342	Cz4	Cz4	m-D1	Cz4	Cz4
1343	m-D1	Cz4	Cz4	Cz4	H
1344	Cz4	Cz4	Cz4	m-D1	H
1345	m-D1	Cz4	Cz4	H	Cz4
1346	Cz4	Cz4	m-D1	H	Cz4
1347	Cz4	m-D1	H	Cz4	Cz4
1348	Cz4	m-D1	Cz4	H	H
1349	Cz4	Cz4	m-D1	H	H
1350	H	m-D1	Cz4	Cz4	H
1351	H	Cz4	m-D1	Cz4	H
1352	m-D1	H	Cz4	H	Cz4
1353	Cz4	H	m-D1	H	Cz4
1354	m-D1	Cz4	H	H	H
1355	H	m-D1	H	Cz4	H
1356	m-D1	m-D1	Cz4	H	Cz4
1357	m-D1	Cz4	m-D1	H	Cz4
1358	Cz4	m-D1	m-D1	H	Cz4
1359	m-D1	m-D1	H	Cz4	Cz4
1360	Cz4	m-D1	H	m-D1	Cz4
1361	m-D1	Cz4	m-D1	H	H
1362	H	m-D1	m-D1	Cz4	H
1363	H	m-D1	Cz4	m-D1	H
1364	m-D1	H	m-D1	H	Cz4
1365	m-D1	H	Cz4	H	m-D1
1366	m-D1	Cz4	m-D1	Cz4	m-D1
1367	m-D1	m-D1	m-D1	Cz4	H
1368	m-D1	m-D1	Cz4	m-D1	H
1369	m-D1	m-D1	m-D1	H	Cz4
1370	m-D1	m-D1	H	m-D1	Cz4
1371	m-D1	m-D1	H	Cz4	m-D1
1372	m-D1	m-D1	m-D1	m-D1	Cz4
1373	Cz4	Cz4	m-D2	Cz4	Cz4
1374	m-D2	Cz4	Cz4	Cz4	H
1375	Cz4	Cz4	Cz4	m-D2	H
1376	m-D2	Cz4	Cz4	H	Cz4
1377	Cz4	Cz4	m-D2	H	Cz4
1378	Cz4	m-D2	H	Cz4	Cz4

TABLE 1-25-continued

No	R^1	R^2	R^3	R^4	R^5
1379	Cz4	m-D2	Cz4	H	H
1380	Cz4	Cz4	m-D2	H	H
1381	H	m-D2	Cz4	Cz4	H
1382	H	Cz4	m-D2	Cz4	H
1383	m-D2	H	Cz4	H	Cz4
1384	Cz4	H	m-D2	H	Cz4
1385	m-D2	Cz4	H	H	H
1386	H	m-D2	H	Cz4	H
1387	m-D2	m-D2	Cz4	H	Cz4
1388	m-D2	Cz4	m-D2	H	Cz4
1389	Cz4	m-D2	m-D2	H	Cz4
1390	m-D2	m-D2	H	Cz4	Cz4
1391	Cz4	m-D2	H	m-D2	Cz4
1392	m-D2	Cz4	m-D2	H	H
1393	H	m-D2	m-D2	Cz4	H
1394	H	m-D2	Cz4	m-D2	H
1395	m-D2	H	m-D2	H	Cz4
1396	m-D2	H	Cz4	H	m-D2
1397	m-D2	Cz4	m-D2	Cz4	m-D2
1398	m-D2	m-D2	m-D2	Cz4	H
1399	m-D2	m-D2	Cz4	m-D2	H

TABLE 1-26

1400	m-D2	m-D2	m-D2	H	Cz4
1401	m-D2	m-D2	H	m-D2	Cz4
1402	m-D2	m-D2	H	Cz4	m-D2
1403	m-D2	m-D2	m-D2	m-D2	Cz4
1404	Cz4	Cz4	m-D3	Cz4	Cz4
1405	m-D3	Cz4	Cz4	Cz4	H
1406	Cz4	Cz4	Cz4	m-D3	H
1407	m-D3	Cz4	Cz4	H	Cz4
1408	Cz4	Cz4	m-D3	H	Cz4
1409	Cz4	m-D3	H	Cz4	Cz4
1410	Cz4	m-D3	Cz4	H	H
1411	Cz4	Cz4	m-D3	H	H
1412	H	m-D3	Cz4	Cz4	H
1413	H	Cz4	m-D3	Cz4	H
1414	m-D3	H	Cz4	H	Cz4
1415	Cz4	H	m-D3	H	Cz4
1416	m-D3	Cz4	H	H	H
1417	H	m-D3	H	Cz4	H
1418	m-D3	m-D3	Cz4	H	Cz4
1419	m-D3	Cz4	m-D3	H	Cz4
1420	Cz4	m-D3	m-D3	H	Cz4
1421	m-D3	m-D3	H	Cz4	Cz4
1422	Cz4	m-D3	H	m-D3	Cz4
1423	m-D3	Cz4	m-D3	H	H
1424	H	m-D3	m-D3	Cz4	H
1425	H	m-D3	Cz4	m-D3	H
1426	m-D3	H	m-D3	H	Cz4
1427	m-D3	H	Cz4	H	m-D3
1428	m-D3	Cz4	m-D3	Cz4	m-D3
1429	m-D3	m-D3	m-D3	Cz4	H
1430	m-D3	m-D3	Cz4	m-D3	H
1431	m-D3	m-D3	m-D3	H	Cz4
1432	m-D3	m-D3	H	m-D3	Cz4
1433	m-D3	m-D3	H	Cz4	m-D3
1434	m-D3	m-D3	m-D3	m-D3	Cz4
1435	Cz5	Cz5	m-D1	Cz5	Cz5
1436	m-D1	Cz5	Cz5	Cz5	H
1437	Cz5	Cz5	Cz5	m-D1	H
1438	m-D1	Cz5	Cz5	H	Cz5
1439	Cz5	Cz5	m-D1	H	Cz5
1440	Cz5	m-D1	H	Cz5	Cz5
1441	Cz5	m-D1	Cz5	H	H
1442	Cz5	Cz5	m-D1	H	H
1443	H	m-D1	Cz5	Cz5	H
1444	H	Cz5	m-D1	Cz5	H
1445	m-D1	H	Cz5	H	Cz5
1446	Cz5	H	m-D1	H	Cz5
1447	m-D1	Cz5	H	H	H
1448	H	m-D1	H	Cz5	H
1449	m-D1	m-D1	Cz5	H	Cz5
1450	m-D1	Cz5	m-D1	H	Cz5

TABLE 1-26-continued

1451	Cz5	m-D1	m-D1	H	Cz5
1452	m-D1	m-D1	H	Cz5	Cz5
1453	Cz5	m-D1	H	m-D1	Cz5
1454	m-D1	Cz5	m-D1	H	H
1455	H	m-D1	m-D1	Cz5	H
1456	H	m-D1	Cz5	m-D1	H
1457	m-D1	H	m-D1	H	Cz5
1458	m-D1	H	Cz5	H	m-D1

TABLE 1-27

1459	m-D1	Cz5	m-D1	Cz5	m-D1
1460	m-D1	m-D1	m-D1	Cz5	H
1461	m-D1	m-D1	Cz5	m-D1	H
1462	m-D1	m-D1	m-D1	H	Cz5
1463	m-D1	m-D1	H	m-D1	Cz5
1464	m-D1	m-D1	H	Cz5	m-D1
1465	m-D1	m-D1	m-D1	m-D1	Cz5
1466	Cz5	Cz5	m-D2	Cz5	Cz5
1467	m-D2	Cz5	Cz5	Cz5	H
1468	Cz5	Cz5	Cz5	m-D2	H
1469	m-D2	Cz5	Cz5	H	Cz5
1470	Cz5	Cz5	m-D2	H	Cz5
1471	Cz5	m-D2	H	Cz5	Cz5
1472	Cz5	m-D2	Cz5	H	H
1473	Cz5	Cz5	m-D2	H	H
1474	H	m-D2	Cz5	Cz5	H
1475	H	Cz5	m-D2	Cz5	H
1476	m-D2	H	Cz5	H	Cz5
1477	Cz5	H	m-D2	H	Cz5
1478	m-D2	Cz5	H	H	H
1479	H	m-D2	H	Cz5	H
1480	m-D2	m-D2	Cz5	H	Cz5
1481	m-D2	Cz5	m-D2	H	Cz5
1482	Cz5	m-D2	m-D2	H	Cz5
1483	m-D2	m-D2	H	Cz5	Cz5
1484	Cz5	m-D2	H	m-D2	Cz5
1485	m-D2	Cz5	m-D2	H	H
1486	H	m-D2	m-D2	Cz5	H
1487	H	m-D2	Cz5	m-D2	H
1488	m-D2	H	m-D2	H	Cz5
1489	m-D2	H	Cz5	H	m-D2
1490	m-D2	Cz5	m-D2	Cz5	m-D2
1491	m-D2	m-D2	m-D2	Cz5	H
1492	m-D2	m-D2	Cz5	m-D2	H
1493	m-D2	m-D2	m-D2	H	Cz5
1494	m-D2	m-D2	H	m-D2	Cz5
1495	m-D2	m-D2	H	Cz5	m-D2
1496	m-D2	m-D2	m-D2	m-D2	Cz5
1497	Cz5	Cz5	m-D3	Cz5	Cz5
1498	m-D3	Cz5	Cz5	Cz5	H
1499	Cz5	Cz5	Cz5	m-D3	H
1500	m-D3	Cz5	Cz5	H	Cz5
1501	Cz5	Cz5	m-D3	H	Cz5
1502	Cz5	m-D3	H	Cz5	Cz5
1503	Cz5	m-D3	Cz5	H	H
1504	Cz5	Cz5	m-D3	H	H
1505	H	m-D3	Cz5	Cz5	H
1506	H	Cz5	m-D3	Cz5	H
1507	m-D3	H	Cz5	H	Cz5
1508	Cz5	H	m-D3	H	Cz5
1509	m-D3	Cz5	H	H	H
1510	H	m-D3	H	Cz5	H
1511	m-D3	m-D3	Cz5	H	Cz5
1512	m-D3	Cz5	m-D3	H	Cz5
1513	Cz5	m-D3	m-D3	H	Cz5
1514	m-D3	m-D3	H	Cz5	Cz5
1515	Cz5	m-D3	H	m-D3	Cz5
1516	m-D3	Cz5	m-D3	H	H
1517	H	m-D3	m-D3	Cz5	H

TABLE 1-28

1518	H	m-D3	Cz5	m-D3	H
1519	m-D3	H	m-D3	H	Cz5
1520	m-D3	H	Cz5	H	m-D3
1521	m-D3	Cz5	m-D3	Cz5	m-D3
1522	m-D3	m-D3	m-D3	Cz5	H
1523	m-D3	m-D3	Cz5	m-D3	H
1524	m-D3	m-D3	m-D3	H	Cz5
1525	m-D3	m-D3	H	m-D3	Cz5
1526	m-D3	m-D3	H	Cz5	m-D3
1527	m-D3	m-D3	m-D3	m-D3	Cz5
1528	Cz6	Cz6	m-D1	Cz6	Cz6
1529	m-D1	Cz6	Cz6	Cz6	H
1530	Cz6	Cz6	Cz6	m-D1	H
1531	m-D1	Cz6	Cz6	H	Cz6
1532	Cz6	Cz6	m-D1	H	Cz6
1533	Cz6	m-D1	H	Cz6	Cz6
1534	Cz6	m-D1	Cz6	H	H
1535	Cz6	Cz6	m-D1	H	H
1536	H	m-D1	Cz6	Cz6	H
1537	H	Cz6	m-D1	Cz6	H
1538	m-D1	H	Cz6	H	Cz6
1539	Cz6	H	m-D1	H	Cz6
1540	m-D1	Cz6	H	H	H
1541	H	m-D1	H	Cz6	H
1542	m-D1	m-D1	Cz6	H	Cz6
1543	m-D1	Cz6	m-D1	H	Cz6
1544	Cz6	m-D1	m-D1	H	Cz6
1545	m-D1	m-D1	H	Cz6	Cz6
1546	Cz6	m-D1	H	m-D1	Cz6
1547	m-D1	Cz6	m-D1	H	H
1548	H	m-D1	m-D1	Cz6	H
1549	H	m-D1	Cz6	m-D1	H
1550	m-D1	H	m-D1	H	Cz6
1551	m-D1	H	Cz6	H	m-D1
1552	m-D1	Cz6	m-D1	Cz6	m-D1
1553	m-D1	m-D1	m-D1	Cz6	H
1554	m-D1	m-D1	Cz6	m-D1	H
1555	m-D1	m-D1	m-D1	H	Cz6
1556	m-D1	m-D1	H	m-D1	Cz6
1557	m-D1	m-D1	H	Cz6	m-D1
1558	m-D1	m-D1	m-D1	m-D1	Cz6
1559	Cz6	Cz6	m-D2	Cz6	Cz6
1560	m-D2	Cz6	Cz6	Cz6	H
1561	Cz6	Cz6	Cz6	m-D2	H
1562	m-D2	Cz6	Cz6	H	Cz6
1563	Cz6	Cz6	m-D2	H	Cz6
1564	Cz6	m-D2	H	Cz6	Cz6
1565	Cz6	m-D2	Cz6	H	H
1566	Cz6	Cz6	m-D2	H	H
1567	H	m-D2	Cz6	Cz6	H
1568	H	Cz6	m-D2	Cz6	H
1569	m-D2	H	Cz6	H	Cz6
1570	Cz6	H	m-D2	H	Cz6
1571	m-D2	Cz6	H	H	H
1572	H	m-D2	H	Cz6	H
1573	m-D2	m-D2	Cz6	H	Cz6
1574	m-D2	Cz6	m-D2	H	Cz6
1575	Cz6	m-D2	m-D2	H	Cz6
1576	m-D2	m-D2	H	Cz6	Cz6

TABLE 1-29

1577	Cz6	m-D2	H	m-D2	Cz6
1578	m-D2	Cz6	m-D2	H	H
1579	H	m-D2	m-D2	Cz6	H
1580	H	m-D2	Cz6	m-D2	H
1581	m-D2	H	m-D2	H	Cz6
1582	m-D2	H	Cz6	H	m-D2
1583	m-D2	Cz6	m-D2	Cz6	m-D2
1584	m-D2	m-D2	m-D2	Cz6	H
1585	m-D2	m-D2	Cz6	m-D2	H
1586	m-D2	m-D2	m-D2	H	Cz6
1587	m-D2	m-D2	H	m-D2	Cz6
1588	m-D2	m-D2	H	Cz6	m-D2
1589	m-D2	m-D2	m-D2	m-D2	Cz6
1590	Cz6	Cz6	m-D3	Cz6	Cz6
1591	m-D3	Cz6	Cz6	Cz6	H
1592	Cz6	Cz6	Cz6	m-D3	H
1593	m-D3	Cz6	Cz6	H	Cz6

TABLE 1-29-continued

1594	Cz6	Cz6	m-D3	H	Cz6
1595	Cz6	m-D3	H	Cz6	Cz6
1596	Cz6	m-D3	Cz6	H	H
1597	Cz6	Cz6	m-D3	H	H
1598	H	m-D3	Cz6	Cz6	H
1599	H	Cz6	m-D3	Cz6	H
1600	m-D3	H	Cz6	H	Cz6
1601	Cz6	H	m-D3	H	Cz6
1602	m-D3	Cz6	H	H	H
1603	H	m-D3	H	Cz6	H
1604	m-D3	m-D3	Cz6	H	Cz6
1605	m-D3	Cz6	m-D3	H	Cz6
1606	Cz6	m-D3	m-D3	H	Cz6
1607	m-D3	m-D3	H	Cz6	Cz6
1608	Cz6	m-D3	H	m-D3	Cz6
1609	m-D3	Cz6	m-D3	H	H
1610	H	m-D3	m-D3	Cz6	H
1611	H	m-D3	Cz6	m-D3	H
1612	m-D3	H	m-D3	H	Cz6
1613	m-D3	H	Cz6	H	m-D3
1614	m-D3	Cz6	m-D3	Cz6	m-D3
1615	m-D3	m-D3	m-D3	Cz6	H
1616	m-D3	m-D3	Cz6	m-D3	H
1617	m-D3	m-D3	m-D3	H	Cz6
1618	m-D3	m-D3	H	m-D3	Cz6
1619	m-D3	m-D3	H	Cz6	m-D3
1620	m-D3	m-D3	m-D3	m-D3	Cz6
1621	Cz7	Cz7	m-D1	Cz7	Cz7
1622	m-D1	Cz7	Cz7	Cz7	H
1623	Cz7	Cz7	Cz7	m-D1	H
1624	m-D1	Cz7	Cz7	H	Cz7
1625	Cz7	Cz7	m-D1	H	Cz7
1626	Cz7	m-D1	H	Cz7	Cz7
1627	Cz7	m-D1	Cz7	H	H
1628	Cz7	Cz7	m-D1	H	H
1629	H	m-D1	Cz7	Cz7	H
1630	H	Cz7	m-D1	Cz7	H
1631	m-D1	H	Cz7	H	Cz7
1632	Cz7	H	m-D1	H	Cz7
1633	m-D1	Cz7	H	H	H
1634	H	m-D1	H	Cz7	H
1635	m-D1	m-D1	Cz7	H	Cz7

TABLE 1-30

1636	m-D1	Cz7	m-D1	H	Cz7
1637	Cz7	m-D1	m-D1	H	Cz7
1638	m-D1	m-D1	H	Cz7	Cz7
1639	Cz7	m-D1	H	m-D1	Cz7
1640	m-D1	Cz7	m-D1	H	H
1641	H	m-D1	m-D1	Cz7	H
1642	H	m-D1	Cz7	m-D1	H
1643	m-D1	H	m-D1	H	Cz7
1644	m-D1	H	Cz7	H	m-D1
1645	m-D1	Cz7	m-D1	Cz7	m-D1
1646	m-D1	m-D1	m-D1	Cz7	H
1647	m-D1	m-D1	Cz7	m-D1	H
1648	m-D1	m-D1	m-D1	H	Cz7
1649	m-D1	m-D1	H	m-D1	Cz7
1650	m-D1	m-D1	H	Cz7	m-D1
1651	m-D1	m-D1	m-D1	m-D1	Cz7
1652	Cz7	Cz7	m-D2	Cz7	Cz7
1653	m-D2	Cz7	Cz7	Cz7	H
1654	Cz7	Cz7	Cz7	m-D2	H
1655	m-D2	Cz7	Cz7	H	Cz7
1656	Cz7	Cz7	m-D2	H	Cz7
1657	Cz7	m-D2	H	Cz7	Cz7
1658	Cz7	m-D2	Cz7	H	H
1659	Cz7	Cz7	m-D2	H	H
1660	H	m-D2	Cz7	Cz7	H
1661	H	Cz7	m-D2	Cz7	H
1662	m-D2	H	Cz7	H	Cz7
1663	Cz7	H	m-D2	H	Cz7
1664	m-D2	Cz7	H	H	H
1665	H	m-D2	H	Cz7	H
1666	m-D2	m-D2	Cz7	H	Cz7
1667	m-D2	Cz7	m-D2	H	Cz7

TABLE 1-30-continued

1668	Cz7	m-D2	m-D2	H	Cz7
1669	m-D2	m-D2	H	Cz7	Cz7
1670	Cz7	m-D2	H	m-D2	Cz7
1671	m-D2	Cz7	m-D2	H	H
1672	H	m-D2	m-D2	Cz7	H
1673	H	m-D2	Cz7	m-D2	H
1674	m-D2	H	m-D2	H	Cz7
1675	m-D2	H	Cz7	H	m-D2
1676	m-D2	Cz7	m-D2	Cz7	m-D2
1677	m-D2	m-D2	m-D2	Cz7	H
1678	m-D2	m-D2	Cz7	m-D2	H
1679	m-D2	m-D2	m-D2	H	Cz7
1680	m-D2	m-D2	H	m-D2	Cz7
1681	m-D2	m-D2	H	Cz7	m-D2
1682	m-D2	m-D2	m-D2	m-D2	Cz7
1683	Cz7	Cz7	m-D3	Cz7	Cz7
1684	m-D3	Cz7	Cz7	Cz7	H
1685	Cz7	Cz7	Cz7	m-D3	H
1686	m-D3	Cz7	Cz7	H	Cz7
1687	Cz7	Cz7	m-D3	H	Cz7
1688	Cz7	m-D3	H	Cz7	Cz7
1689	Cz7	m-D3	Cz7	H	H
1690	Cz7	Cz7	m-D3	H	H
1691	H	m-D3	Cz7	Cz7	H
1692	H	Cz7	m-D3	Cz7	H
1693	m-D3	H	Cz7	H	Cz7
1694	Cz7	H	m-D3	H	Cz7

TABLE 1-31

1695	m-D3	Cz7	H	H	H
1696	H	m-D3	H	Cz7	H
1697	m-D3	m-D3	Cz7	H	Cz7
1698	m-D3	Cz7	m-D3	H	Cz7
1699	Cz7	m-D3	m-D3	H	Cz7
1700	m-D3	m-D3	H	Cz7	Cz7
1701	Cz7	m-D3	H	m-D3	Cz7
1702	m-D3	Cz7	m-D3	H	H
1703	H	m-D3	m-D3	Cz7	H
1704	H	m-D3	Cz7	m-D3	H
1705	m-D3	H	m-D3	H	Cz7
1706	m-D3	H	Cz7	H	m-D3
1707	m-D3	Cz7	m-D3	Cz7	m-D3
1708	m-D3	m-D3	m-D3	Cz7	H
1709	m-D3	m-D3	Cz7	m-D3	H
1710	m-D3	m-D3	m-D3	H	Cz7
1711	m-D3	m-D3	H	m-D3	Cz7
1712	m-D3	m-D3	H	Cz7	m-D3
1713	m-D3	m-D3	m-D3	m-D3	Cz7
1714	Cz8	Cz8	m-D1	Cz8	Cz8
1715	m-D1	Cz8	Cz8	Cz8	H
1716	Cz8	Cz8	Cz8	m-D1	H
1717	m-D1	Cz8	Cz8	H	Cz8
1718	Cz8	Cz8	m-D1	H	Cz8
1719	Cz8	m-D1	H	Cz8	Cz8
1720	Cz8	m-D1	Cz8	H	H
1721	Cz8	Cz8	m-D1	H	H
1722	H	m-D1	Cz8	Cz8	H
1723	H	Cz8	m-D1	Cz8	H
1724	m-D1	H	Cz8	H	Cz8
1725	Cz8	H	m-D1	H	Cz8
1726	m-D1	Cz8	H	H	H
1727	H	m-D1	H	Cz8	H
1728	m-D1	m-D1	Cz8	H	Cz8
1729	m-D1	Cz8	m-D1	H	Cz8
1730	Cz8	m-D1	m-D1	H	Cz8
1731	m-D1	m-D1	H	Cz8	Cz8
1732	Cz8	m-D1	H	m-D1	Cz8
1733	m-D1	Cz8	m-D1	H	H
1734	H	m-D1	m-D1	Cz8	H
1735	H	m-D1	Cz8	m-D1	H
1736	m-D1	H	m-D1	H	Cz8
1737	m-D1	H	Cz8	H	m-D1
1738	m-D1	Cz8	m-D1	Cz8	m-D1
1739	m-D1	m-D1	m-D1	Cz8	H
1740	m-D1	m-D1	Cz8	m-D1	H
1741	m-D1	m-D1	m-D1	H	Cz8

TABLE 1-31-continued

1742	m-D1	m-D1	H	m-D1	Cz8
1743	m-D1	m-D1	H	Cz8	m-D1
1744	m-D1	m-D1	m-D1	m-D1	Cz8
1745	Cz8	Cz8	m-D2	Cz8	Cz8
1746	m-D2	Cz8	Cz8	Cz8	H
1747	Cz8	Cz8	Cz8	m-D2	H
1748	m-D2	Cz8	Cz8	H	Cz8
1749	Cz8	Cz8	m-D2	H	Cz8
1750	Cz8	m-D2	H	Cz8	Cz8
1751	Cz8	m-D2	Cz8	H	H
1752	Cz8	Cz8	m-D2	H	H
1753	H	m-D2	Cz8	Cz8	H

TABLE 1-32

1754	H	Cz8	m-D2	Cz8	H
1755	m-D2	H	Cz8	H	Cz8
1756	Cz8	H	m-D2	H	Cz8
1757	m-D2	Cz8	H	H	H
1758	H	m-D2	H	Cz8	H
1759	m-D2	m-D2	Cz8	H	Cz8
1760	m-D2	Cz8	m-D2	H	Cz8
1761	Cz8	m-D2	m-D2	H	Cz8
1762	m-D2	m-D2	H	Cz8	Cz8
1763	Cz8	m-D2	H	m-D2	Cz8
1764	m-D2	Cz8	m-D2	H	H
1765	H	m-D2	m-D2	Cz8	H
1766	H	m-D2	Cz8	m-D2	H
1767	m-D2	H	m-D2	H	Cz8
1768	m-D2	H	Cz8	H	m-D2
1769	m-D2	Cz8	m-D2	Cz8	m-D2
1770	m-D2	m-D2	m-D2	Cz8	H
1771	m-D2	m-D2	Cz8	m-D2	H
1772	m-D2	m-D2	m-D2	H	Cz8
1773	m-D2	m-D2	H	m-D2	Cz8
1774	m-D2	m-D2	H	Cz8	m-D2
1775	m-D2	m-D2	m-D2	m-D2	Cz8
1776	Cz8	Cz8	m-D3	Cz8	Cz8
1777	m-D3	Cz8	Cz8	Cz8	H
1778	Cz8	Cz8	Cz8	m-D3	H
1779	m-D3	Cz8	Cz8	H	Cz8
1780	Cz8	Cz8	m-D3	H	Cz8
1781	Cz8	m-D3	H	Cz8	Cz8
1782	Cz8	m-D3	Cz8	H	H
1783	Cz8	Cz8	m-D3	H	H
1784	H	m-D3	Cz8	Cz8	H
1785	H	Cz8	m-D3	Cz8	H
1786	m-D3	H	Cz8	H	Cz8
1787	Cz8	H	m-D3	H	Cz8
1788	m-D3	Cz8	H	H	H
1789	H	m-D3	H	Cz8	H
1790	m-D3	m-D3	Cz8	H	Cz8
1791	m-D3	Cz8	m-D3	H	Cz8
1792	Cz8	m-D3	m-D3	H	Cz8
1793	m-D3	m-D3	H	Cz8	Cz8
1794	Cz8	m-D3	H	m-D3	Cz8
1795	m-D3	Cz8	m-D3	H	H
1796	H	m-D3	m-D3	Cz8	H
1797	H	m-D3	Cz8	m-D3	H
1798	m-D3	H	m-D3	H	Cz8
1799	m-D3	H	Cz8	H	m-D3
1800	m-D3	Cz8	m-D3	Cz8	m-D3
1801	m-D3	m-D3	m-D3	Cz8	H
1802	m-D3	m-D3	Cz8	m-D3	H
1803	m-D3	m-D3	m-D3	H	Cz8
1804	m-D3	m-D3	H	m-D3	Cz8
1805	m-D3	m-D3	H	Cz8	m-D3
1806	m-D3	m-D3	m-D3	m-D3	Cz8

TABLE 1-33

No	R^1	R^2	R^3	R^4	R^5
1807	m-D1	Cz	Cz	Cz	methyl
1808	Cz	Cz	Cz	m-D1	methyl
1809	m-D1	Cz	Cz	methyl	Cz
1810	Cz	Cz	m-D1	methyl	Cz
1811	Cz	m-D1	methyl	Cz	Cz
1812	Cz	m-D1	Cz	methyl	methyl
1813	Cz	Cz	m-D1	methyl	methyl
1814	methyl	m-D1	Cz	Cz	methyl
1815	methyl	Cz	m-D1	Cz	methyl
1816	m-D1	methyl	Cz	methyl	Cz
1817	Cz	methyl	m-D1	methyl	Cz
1818	m-D1	Cz	methyl	methyl	methyl
1819	methyl	m-D1	methyl	Cz	methyl
1820	m-D1	m-D1	Cz	methyl	Cz
1821	m-D1	Cz	m-D1	methyl	Cz
1822	Cz	m-D1	m-D1	methyl	Cz
1823	m-D1	m-D1	methyl	Cz	Cz
1824	Cz	m-D1	methyl	m-D1	Cz
1825	m-D1	Cz	m-D1	methyl	methyl
1826	methyl	m-D1	m-D1	Cz	methyl
1827	methyl	m-D1	Cz	m-D1	methyl
1828	m-D1	methyl	m-D1	methyl	Cz
1829	m-D1	methyl	Cz	methyl	m-D1
1830	methyl	m-D1	m-D1	methyl	methyl
1831	m-D1	m-D1	m-D1	Cz	methyl
1832	m-D1	m-D1	Cz	m-D1	methyl
1833	m-D1	m-D1	m-D1	methyl	Cz
1834	m-D1	m-D1	methyl	m-D1	Cz
1835	m-D1	m-D1	methyl	Cz	m-D1
1836	m-D1	m-D1	methyl	m-D1	methyl
1837	methyl	m-D1	m-D1	m-D1	methyl
1838	m-D1	m-D1	m-D1	m-D1	methyl
1839	m-D1	m-D1	methyl	m-D1	m-D1
1840	m-D2	Cz	Cz	Cz	methyl
1841	Cz	Cz	Cz	m-D2	methyl
1842	m-D2	Cz	Cz	methyl	Cz
1843	Cz	Cz	m-D2	methyl	Cz
1844	Cz	m-D2	methyl	Cz	Cz
1845	Cz	m-D2	Cz	methyl	methyl
1846	Cz	Cz	m-D2	methyl	methyl
1847	methyl	m-D2	Cz	Cz	methyl
1848	methyl	Cz	m-D2	Cz	methyl
1849	m-D2	methyl	Cz	methyl	Cz
1850	Cz	methyl	m-D2	methyl	Cz
1851	m-D2	Cz	methyl	methyl	methyl
1852	methyl	m-D2	methyl	Cz	methyl
1853	m-D2	m-D2	Cz	methyl	Cz
1854	m-D2	Cz	m-D2	methyl	Cz
1855	Cz	m-D2	m-D2	methyl	Cz
1856	m-D2	m-D2	methyl	Cz	Cz
1857	Cz	m-D2	methyl	m-D2	Cz
1858	m-D2	Cz	m-D2	methyl	methyl
1859	methyl	m-D2	m-D2	Cz	methyl
1860	methyl	m-D2	Cz	m-D2	methyl
1861	m-D2	methyl	m-D2	methyl	Cz
1862	m-D2	methyl	Cz	methyl	m-D2
1863	methyl	m-D2	m-D2	methyl	methyl
1864	m-D2	m-D2	m-D2	Cz	methyl

TABLE 1-34

1865	m-D2	m-D2	Cz	m-D2	methyl
1866	m-D2	m-D2	m-D2	methyl	Cz
1867	m-D2	m-D2	methyl	m-D2	Cz
1868	m-D2	m-D2	methyl	Cz	m-D2
1869	m-D2	m-D2	methyl	m-D2	methyl
1870	methyl	m-D2	m-D2	m-D2	methyl
1871	m-D2	m-D2	m-D2	m-D2	methyl
1872	m-D2	m-D2	methyl	m-D2	m-D2
1873	m-D3	Cz	Cz	Cz	methyl
1874	Cz	Cz	Cz	m-D3	methyl
1875	m-D3	Cz	Cz	methyl	Cz
1876	Cz	Cz	m-D3	methyl	Cz
1877	Cz	m-D3	methyl	Cz	Cz
1878	Cz	m-D3	Cz	methyl	methyl
1879	Cz	Cz	m-D3	methyl	methyl
1880	methyl	m-D3	Cz	Cz	methyl

TABLE 1-34-continued

1881	methyl	Cz	m-D3	Cz	methyl
1882	m-D3	methyl	Cz	methyl	Cz
1883	Cz	methyl	m-D3	methyl	Cz
1884	m-D3	Cz	methyl	methyl	methyl
1885	methyl	m-D3	methyl	Cz	methyl
1886	m-D3	m-D3	Cz	methyl	Cz
1887	m-D3	Cz	m-D3	methyl	Cz
1888	Cz	m-D3	m-D3	methyl	Cz
1889	m-D3	m-D3	methyl	Cz	Cz
1890	Cz	m-D3	methyl	m-D3	Cz
1891	m-D3	Cz	m-D3	methyl	methyl
1892	methyl	m-D3	m-D3	Cz	methyl
1893	methyl	m-D3	Cz	m-D3	methyl
1894	m-D3	methyl	m-D3	methyl	Cz
1895	m-D3	methyl	Cz	methyl	m-D3
1896	methyl	m-D3	m-D3	methyl	methyl
1897	m-D3	m-D3	m-D3	Cz	methyl
1898	m-D3	m-D3	Cz	m-D3	methyl
1899	m-D3	m-D3	m-D3	methyl	Cz
1900	m-D3	m-D3	methyl	m-D3	Cz
1901	m-D3	m-D3	methyl	Cz	m-D3
1902	m-D3	m-D3	methyl	m-D3	methyl
1903	methyl	m-D3	m-D3	m-D3	methyl
1904	m-D3	m-D3	m-D3	m-D3	methyl
1905	m-D3	m-D3	methyl	m-D3	m-D3
1906	m-D1	Cz	Cz	Cz	phenyl
1907	Cz	Cz	Cz	m-D1	phenyl
1908	m-D1	Cz	Cz	phenyl	Cz
1909	Cz	Cz	m-D1	phenyl	Cz
1910	Cz	m-D1	phenyl	Cz	Cz
1911	Cz	m-D1	Cz	phenyl	phenyl
1912	Cz	Cz	m-D1	phenyl	phenyl
1913	phenyl	m-D1	Cz	Cz	phenyl
1914	phenyl	Cz	m-D1	Cz	phenyl
1915	m-D1	phenyl	Cz	phenyl	Cz
1916	Cz	phenyl	m-D1	phenyl	Cz
1917	m-D1	Cz	phenyl	phenyl	phenyl
1918	phenyl	m-D1	phenyl	Cz	phenyl
1919	m-D1	m-D1	Cz	phenyl	Cz
1920	m-D1	Cz	m-D1	phenyl	Cz
1921	Cz	m-D1	m-D1	phenyl	Cz
1922	m-D1	m-D1	phenyl	Cz	Cz
1923	Cz	m-D1	phenyl	m-D1	Cz

TABLE 1-35

1924	m-D1	Cz	m-D1	phenyl	phenyl
1925	phenyl	m-D1	m-D1	Cz	phenyl
1926	phenyl	m-D1	Cz	m-D1	phenyl
1927	m-D1	phenyl	m-D1	phenyl	Cz
1928	m-D1	phenyl	Cz	phenyl	m-D1
1929	phenyl	m-D1	m-D1	phenyl	phenyl
1930	m-D1	m-D1	m-D1	Cz	phenyl
1931	m-D1	m-D1	Cz	m-D1	phenyl
1932	m-D1	m-D1	m-D1	phenyl	Cz
1933	m-D1	m-D1	phenyl	m-D1	Cz
1934	m-D1	m-D1	phenyl	Cz	m-D1
1935	m-D1	m-D1	phenyl	m-D1	phenyl
1936	phenyl	m-D1	m-D1	m-D1	phenyl
1937	m-D1	m-D1	m-D1	m-D1	phenyl
1938	m-D1	m-D1	phenyl	m-D1	m-D1
1939	m-D2	Cz	Cz	Cz	phenyl
1940	Cz	Cz	Cz	m-D2	phenyl
1941	m-D2	Cz	Cz	phenyl	Cz
1942	Cz	Cz	m-D2	phenyl	Cz
1943	Ca	m-D2	phenyl	Cz	Cz
1944	Cz	m-D2	Cz	phenyl	phenyl
1945	Cz	Cz	m-D2	phenyl	phenyl
1946	phenyl	m-D2	Cz	Cz	phenyl
1947	phenyl	Cz	m-D2	Cz	phenyl
1948	m-D2	phenyl	Cz	phenyl	Cz
1949	Cz	phenyl	m-D2	phenyl	Cz
1950	m-D2	Cz	phenyl	phenyl	phenyl
1951	phenyl	m-D2	phenyl	Cz	phenyl
1952	m-D2	m-D2	Cz	phenyl	Cz
1953	m-D2	Cz	m-D2	phenyl	Cz
1954	Cz	m-D2	m-D2	phenyl	Cz

TABLE 1-35-continued

1955	m-D2	m-D2	phenyl	Cz	Cz
1956	Cz	m-D2	phenyl	m-D2	Cz
1957	m-D2	Cz	m-D2	phenyl	phenyl
1958	phenyl	m-D2	m-D2	Cz	phenyl
1959	phenyl	m-D2	Cz	m-D2	phenyl
1960	m-D2	phenyl	m-D2	phenyl	Cz
1961	m-D2	phenyl	Cz	phenyl	m-D2
1962	phenyl	m-D2	m-D2	phenyl	phenyl
1963	m-D2	m-D2	m-D2	Cz	phenyl
1964	m-D2	m-D2	Cz	m-D2	phenyl
1965	m-D2	m-D2	m-D2	phenyl	Cz
1966	m-D2	m-D2	phenyl	m-D2	Cz
1967	m-D2	m-D2	phenyl	Cz	m-D2
1968	m-D2	m-D2	phenyl	m-D2	phenyl
1969	phenyl	m-D2	m-D2	m-D2	phenyl
1970	m-D2	m-D2	m-D2	m-D2	phenyl
1971	m-D2	m-D2	phenyl	m-D2	m-D2
1972	m-D3	Cz	Cz	Cz	phenyl
1973	Cz	Cz	Cz	m-D3	phenyl
1974	m-D3	Cz	Cz	phenyl	Cz
1975	Cz	Cz	m-D3	phenyl	Cz
1976	Cz	m-D3	phenyl	Cz	Cz
1977	Cz	m-D3	Cz	phenyl	phenyl
1978	Cz	Cz	m-D3	phenyl	phenyl
1979	phenyl	m-D3	Cz	Cz	phenyl
1980	phenyl	Cz	m-D3	Cz	phenyl
1981	m-D3	phenyl	Cz	phenyl	Cz
1982	Cz	phenyl	m-D3	phenyl	Cz

TABLE 1-36

1983	m-D3	Cz	phenyl	phenyl	phenyl
1984	phenyl	m-D3	phenyl	Cz	phenyl
1985	m-D3	m-D3	Cz	phenyl	Cz
1986	m-D3	Cz	m-D3	phenyl	Cz
1987	Cz	m-D3	m-D3	phenyl	Cz
1988	m-D3	m-D3	phenyl	Cz	Cz
1989	Cz	m-D3	phenyl	m-D3	Cz
1990	m-D3	Cz	m-D3	phenyl	phenyl
1991	phenyl	m-D3	m-D3	Cz	phenyl
1992	phenyl	m-D3	Cz	m-D3	phenyl
1993	m-D3	phenyl	m-D3	phenyl	Cz
1994	m-D3	phenyl	Cz	phenyl	m-D3
1995	phenyl	m-D3	m-D3	phenyl	phenyl
1996	m-D3	m-D3	m-D3	Cz	phenyl
1997	m-D3	m-D3	Cz	m-D3	phenyl
1998	m-D3	m-D3	m-D3	phenyl	Cz
1999	m-D3	m-D3	phenyl	m-D3	Cz
2000	m-D3	m-D3	phenyl	Cz	m-D3
2001	m-D3	m-D3	phenyl	m-D3	phenyl
2002	phenyl	m-D3	m-D3	m-D3	phenyl
2003	m-D3	m-D3	m-D3	m-D3	phenyl
2004	m-D3	m-D3	phenyl	m-D3	m-D3
2005	m-D1	Cz	Cz	Cz	4-pyridyl
2006	Cz	Cz	Cz	m-D1	4-pyridyl
2007	m-D1	Cz	Cz	4-pyridyl	Cz
2008	Cz	Cz	m-D1	4-pyridyl	Cz
2009	Cz	m-D1	4-pyridyl	Cz	Cz
2010	Cz	m-D1	Cz	4-pyridyl	4-pyridyl
2011	Cz	Cz	m-D1	4-pyridyl	4-pyridyl
2012	4-pyridyl	m-D1	Cz	Cz	4-pyridyl
2013	4-pyridyl	Cz	m-D1	Cz	4-pyridyl
2014	m-D1	4-pyridyl	Cz	4-pyridyl	Cz
2015	Cz	4-pyridyl	m-D1	4-pyridyl	Cz
2016	m-D1	Cz	4-pyridyl	4-pyridyl	4-pyridyl
2017	4-pyridyl	m-D1	4-pyridyl	Cz	4-pyridyl
2018	m-D1	m-D1	Cz	4-pyridyl	Cz
2019	m-D1	Cz	m-D1	4-pyridyl	Cz
2020	Cz	m-D1	m-D1	4-pyridyl	Cz
2021	m-D1	m-D1	4-pyridyl	Cz	Cz
2022	Cz	m-D1	4-pyridyl	m-D1	Cz
2023	m-D1	Cz	m-D1	4-pyridyl	4-pyridyl
2024	4-pyridyl	m-D1	m-D1	Cz	4-pyridyl
2025	4-pyridyl	m-D1	Cz	m-D1	4-pyridyl
2026	m-D1	4-pyridyl	m-D1	4-pyridyl	Cz
2027	m-D1	4-pyridyl	Cz	4-pyridyl	m-D1
2028	4-pyridyl	m-D1	m-D1	4-pyridyl	4-pyridyl

TABLE 1-36-continued

2029	m-D1	m-D1	m-D1	Cz	4-pyridyl
2030	m-D1	m-D1	Cz	m-D1	4-pyridyl
2031	m-D1	m-D1	m-D1	4-pyridyl	Cz
2032	m-D1	m-D1	4-pyridyl	m-D1	Cz
2033	m-D1	m-D1	4-pyridyl	Cz	m-D1
2034	m-D1	m-D1	4-pyridyl	m-D1	4-pyridyl
2035	4-pyridyl	m-D1	m-D1	m-D1	4-pyridyl
2036	m-D1	m-D1	m-D1	m-D1	4-pyridyl
2037	m-D1	m-D1	4-pyridyl	m-D1	m-D1
2038	m-D2	Cz	Cz	Cz	4-pyridyl
2039	Cz	Cz	Cz	m-D2	4-pyridyl
2040	m-D2	Cz	Cz	4-pyridyl	Cz
2041	Cz	Cz	m-D2	4-pyridyl	Cz

TABLE 1-37

2042	Cz	m-D2	4-pyridyl	Cz	Cz
2043	Cz	m-D2	Cz	4-pyridyl	4-pyridyl
2044	Cz	Cz	m-D2	4-pyridyl	4-pyridyl
2045	4-pyridyl	m-D2	Cz	Cz	4-pyridyl
2046	4-pyridyl	Cz	m-D2	Cz	4-pyridyl
2047	m-D2	4-pyridyl	Cz	4-pyridyl	Cz
2048	Cz	4-pyridyl	m-D2	4-pyridyl	Cz
2049	m-D2	Cz	4-pyridyl	4-pyridyl	4-pyridyl
2050	4-pyridyl	m-D2	4-pyridyl	Cz	4-pyridyl
2051	m-D2	m-D2	Cz	4-pyridyl	Cz
2052	m-D2	Cz	m-D2	4-pyridyl	Cz
2053	Cz	m-D2	m-D2	4-pyridyl	Cz
2054	m-D2	m-D2	4-pyridyl	Cz	Cz
2055	Cz	m-D2	4-pyridyl	m-D2	Cz
2056	m-D2	Cz	m-D2	4-pyridyl	4-pyridyl
2057	4-pyridyl	m-D2	m-D2	Cz	4-pyridyl
2058	4-pyridyl	m-D2	Cz	m-D2	4-pyridyl
2059	m-D2	4-pyridyl	m-D2	4-pyridyl	Cz
2060	m-D2	4-pyridyl	Cz	4-pyridyl	m-D2
2061	4-pyridyl	m-D2	m-D2	4-pyridyl	4-pyridyl
2062	m-D2	m-D2	m-D2	Cz	4-pyridyl
2063	m-D2	m-D2	Cz	m-D2	4-pyridyl
2064	m-D2	m-D2	m-D2	4-pyridyl	Cz
2065	m-D2	m-D2	4-pyridyl	m-D2	Cz
2066	m-D2	m-D2	4-pyridyl	Cz	m-D2
2067	m-D2	m-D2	4-pyridyl	m-D2	4-pyridyl
2068	4-pyridyl	m-D2	m-D2	m-D2	4-pyridyl
2069	m-D2	m-D2	m-D2	m-D2	4-pyridyl
2070	m-D2	m-D2	4-pyridyl	m-D2	m-D2
2071	m-D3	Cz	Cz	Cz	4-pyridyl
2072	Cz	Cz	Cz	m-D3	4-pyridyl
2073	m-D3	Cz	Cz	4-pyridyl	Cz
2074	Cz	Cz	m-D3	4-pyridyl	Cz
2075	Cz	m-D3	4-pyridyl	Cz	Cz
2076	Cz	m-D3	Cz	4-pyridyl	4-pyridyl
2077	Cz	Cz	m-D3	4-pyridyl	4-pyridyl
2078	4-pyridyl	m-D3	Cz	Cz	4-pyridyl
2079	4-pyridyl	Cz	m-D3	Cz	4-pyridyl
2080	m-D3	4-pyridyl	Cz	4-pyridyl	Cz
2081	Cz	4-pyridyl	m-D3	4-pyridyl	Cz
2082	m-D3	Cz	4-pyridyl	4-pyridyl	4-pyridyl
2083	4-pyridyl	m-D3	4-pyridyl	Cz	4-pyridyl
2084	m-D3	m-D3	Cz	4-pyridyl	Cz
2085	m-D3	Cz	m-D3	4-pyridyl	Cz
2086	Cz	m-D3	m-D3	4-pyridyl	Cz
2087	m-D3	m-D3	4-pyridyl	Cz	Cz
2088	Cz	m-D3	4-pyridyl	m-D3	Cz
2089	m-D3	Cz	m-D3	4-pyridyl	4-pyridyl
2090	4-pyridyl	m-D3	m-D3	Cz	4-pyridyl
2091	4-pyridyl	m-D3	Cz	m-D3	4-pyridyl
2092	m-D3	4-pyridyl	m-D3	4-pyridyl	Cz
2093	m-D3	4-pyridyl	Cz	4-pyridyl	m-D3
2094	4-pyridyl	m-D3	m-D3	4-pyridyl	4-pyridyl
2095	m-D3	m-D3	m-D3	Cz	4-pyridyl
2098	m-D3	m-D3	Cz	m-D3	4-pyridyl
2097	m-D3	m-D3	m-D3	4-pyridyl	Cz
2098	m-D3	m-D3	4-pyridyl	m-D3	Cz
2099	m-D3	m-D3	4-pyridyl	Cz	m-D3
2100	m-D3	m-D3	4-pyridyl	m-D3	4-pyridyl

TABLE 1-38

2101	4-pyridyl	m-D3	m-D3	m-D3	4-pyridyl
2102	m-D3	m-D3	m-D3	m-D3	4-pyridyl
2103	m-D3	m-D3	4-pyridyl	m-D3	m-D3
2104	m-D1	Cz	Cz	Cz	methoxy
2105	Cz	Cz	Cz	m-D1	methoxy
2106	m-D1	Cz	Cz	methoxy	Cz
2107	Cz	Cz	m-D1	methoxy	Cz
2108	Cz	m-D1	methoxy	Cz	Cz
2109	Cz	m-D1	Cz	methoxy	methoxy
2110	Cz	Cz	m-D1	methoxy	methoxy
2111	methoxy	m-D1	Cz	Cz	methoxy
2112	methoxy	Cz	m-D1	Cz	methoxy
2113	m-D1	methoxy	Cz	methoxy	Cz
2114	Cz	methoxy	m-D1	methoxy	Cz
2115	m-D1	Cz	methoxy	methoxy	methoxy
2116	methoxy	m-D1	methoxy	Cz	methoxy
2117	m-D1	m-D1	Cz	methoxy	Cz
2118	m-D1	Cz	m-D1	methoxy	Cz
2119	Cz	m-D1	m-D1	methoxy	Cz
2120	m-D1	m-D1	methoxy	Cz	Cz
2121	Cz	m-D1	methoxy	m-D1	Cz
2122	m-D1	Cz	m-D1	methoxy	methoxy
2123	methoxy	m-D1	m-D1	Cz	methoxy
2124	methoxy	m-D1	Cz	m-D1	methoxy
2125	m-D1	methoxy	m-D1	methoxy	Cz
2126	m-D1	methoxy	Cz	methoxy	m-D1
2127	methoxy	m-D1	m-D1	methoxy	methoxy
2128	m-D1	m-D1	m-D1	Cz	methoxy
2129	m-D1	m-D1	Cz	m-D1	methoxy
2130	m-D1	m-D1	m-D1	methoxy	Cz
2131	m-D1	m-D1	methoxy	m-D1	Cz
2132	m-D1	m-D1	methoxy	Cz	m-D1
2133	m-D1	m-D1	methoxy	m-D1	methoxy
2134	methoxy	m-D1	m-D1	m-D1	methoxy
2135	m-D1	m-D1	m-D1	m-D1	methoxy
2136	m-D1	m-D1	methoxy	m-D1	m-D1
2137	m-D2	Cz	Cz	Cz	methoxy
2138	Cz	Cz	Cz	m-D2	methoxy
2139	m-D2	Cz	Cz	methoxy	Cz
2140	Cz	Cz	m-D2	methoxy	Cz
2141	Cz	m-D2	methoxy	Cz	Cz
2142	Cz	m-D2	Cz	methoxy	methoxy
2143	Cz	Cz	m-D2	methoxy	methoxy
2144	methoxy	m-D2	Cz	Cz	methoxy
2145	methoxy	Cz	m-D2	Cz	methoxy
2146	m-D2	methoxy	Cz	methoxy	Cz
2147	Cz	methoxy	m-D2	methoxy	Cz
2148	m-D2	Cz	methoxy	methoxy	methoxy
2149	methoxy	m-D2	methoxy	Cz	methoxy
2150	m-D2	m-D2	Cz	methoxy	Cz
2151	m-D2	Cz	m-D2	methoxy	Cz
2152	Cz	m-D2	m-D2	methoxy	Cz
2153	m-D2	m-D2	methoxy	Cz	Cz
2154	Cz	m-D2	methoxy	m-D2	Cz
2155	m-D2	Cz	m-D2	methoxy	methoxy
2156	methoxy	m-D2	m-D2	Cz	methoxy
2157	methoxy	m-D2	Cz	m-D2	methoxy
2158	m-D2	methoxy	m-D2	methoxy	Cz
2159	m-D2	methoxy	Cz	methoxy	m-D2

TABLE 1-39

2160	methoxy	m-D2	m-D2	methoxy	methoxy
2161	m-D2	m-D2	m-D2	Cz	methoxy
2162	m-D2	m-D2	Cz	m-D2	methoxy
2163	m-D2	m-D2	m-D2	methoxy	Cz
2164	m-D2	m-D2	methoxy	m-D2	Cz
2165	m-D2	m-D2	methoxy	Cz	m-D2
2166	m-D2	m-D2	methoxy	m-D2	methoxy
2167	methoxy	m-D2	m-D2	m-D2	methoxy
2168	m-D2	m-D2	m-D2	m-D2	methoxy
2169	m-D2	m-D2	methoxy	m-D2	m-D2
2170	m-D3	Cz	Cz	Cz	methoxy
2171	Cz	Cz	Cz	m-D3	methoxy
2172	m-D3	Cz	Cz	methoxy	Cz
2173	Cz	Cz	m-D3	methoxy	Cz
2174	Cz	m-D3	methoxy	Cz	Cz

TABLE 1-39-continued

2175	Cz	m-D3	Cz	methoxy	methoxy
2176	Cz	Cz	m-D3	methoxy	methoxy
2177	methoxy	m-D3	Cz	Cz	methoxy
2178	methoxy	Cz	m-D3	Cz	methoxy
2179	m-D3	methoxy	Cz	methoxy	Cz
2180	Cz	methoxy	m-D3	methoxy	Cz
2181	m-D3	Cz	methoxy	methoxy	methoxy
2182	methoxy	m-D3	methoxy	Cz	methoxy
2183	m-D3	m-D3	Cz	methoxy	Cz
2184	m-D3	Cz	m-D3	methoxy	Cz
2185	Cz	m-D3	m-D3	methoxy	Cz
2186	m-D3	m-D3	methoxy	Cz	Cz
2187	Cz	m-D3	methoxy	m-D3	Cz
2188	m-D3	Cz	m-D3	methoxy	methoxy
2189	methoxy	m-D3	m-D3	Cz	methoxy
2190	methoxy	m-D3	Cz	m-D3	methoxy
2191	m-D3	methoxy	m-D3	methoxy	Cz
2192	m-D3	methoxy	Cz	methoxy	m-D3
2193	methoxy	m-D3	m-D3	methoxy	methoxy
2194	m-D3	m-D3	m-D3	Cz	methoxy
2195	m-D3	m-D3	Cz	m-D3	methoxy
2196	m-D3	m-D3	m-D3	methoxy	Cz
2197	m-D3	m-D3	methoxy	m-D3	Cz
2198	m-D3	m-D3	methoxy	Cz	m-D3
2199	m-D3	m-D3	methoxy	m-D3	methoxy
2200	methoxy	m-D3	m-D3	m-D3	methoxy
2201	m-D3	m-D3	m-D3	m-D3	methoxy
2202	m-D3	m-D3	methoxy	m-D3	m-D3

TABLE 1-40

No	R^1	R^2	R^3	R^4	R^5
2203	Cz	m-D1	Cz	H	m-D2
2204	Cz	m-D2	Cz	H	m-D1
2205	m-D1	Cz	H	m-D2	Cz
2206	m-D2	Cz	H	m-D3	Cz
2207	m-D1	m-D2	H	Cz	H
2208	m-D2	m-D3	H	Cz	H
2209	m-D1	Cz	H	m-D2	H
2210	m-D2	Cz	H	m-D1	H
2211	Cz	m-D1	H	m-D2	H
2212	Cz	m-D2	H	m-D1	H
2213	m-D1	H	m-D2	Cz	H
2214	m-D2	H	m-D3	H	Cz
2215	m-D1	H	m-D2	H	Cz
2216	m-D1	H	m-D3	H	Cz
2217	m-D1	H	Cz	H	m-D2
2218	m-D1	H	Cz	H	m-D3
2219	m-D2	H	Cz	H	m-D3
2220	m-D1	H	H	m-D2	H
2221	m-D2	H	H	m-D3	H
2222	H	m-D1	H	m-D3	H
2223	m-D1	H	H	H	m-D2
2224	m-D1	H	H	H	m-D3
2225	m-D2	H	H	H	m-D3
2226	m-D1	H	m-D2	H	m-D1
2227	m-D2	H	m-D3	H	m-D2
2228	m-D2	H	m-D3	H	m-D2
2229	m-D3	H	m-D2	H	m-D3
2230	m-D1	m-D2	m-D3	H	H
2231	m-D1	m-D2	m-D1	H	H
2232	m-D1	m-D3	H	m-D3	H
2233	m-D1	m-D2	H	m-D3	H
2234	m-D1	m-D2	m-D3	H	m-D4
2235	m-D1	m-D1	m-D2	H	m-D4
2236	m-D2	m-D2	H	m-D3	m-D2

TABLE 1-41

No	R^1	R^2	R^3	R^4	R^5
2237	Cz	Cz	m-D1	H	phenyl
2238	H	m-D1	Cz	Cz	methyl
2239	m-D1	H	Cz	metoxy	Cz

TABLE 1-41-continued

No	R^1	R^2	R^3	R^4	R^5
2240	Cz	methyl	m-D1	phenyl	Cz
2241	m-D1	H	Cz	H	methyl
2242	Cz	methyl	m-D1	H	H
2243	methyl	m-D1	H	Cz	H
2244	m-D1	H	m-D1	Cz	methyl
2245	m-D1	methyl	m-D1	H	Cz
2246	m-D1	H	Cz	methoxy	m-D1
2247	m-D1	H	m-D1	H	methyl
2248	H	m-D1	methyl	m-D1	H
2249	H	m-D1	phenyl	m-D1	H
2250	m-D1	H	methyl	H	m-D1
2251	m-D1	H	phenyl	H	m-D1
2252	m-D1	H	methoxy	H	m-D1
2253	m-D1	methyl	phenyl	methoxy	m-D1
2254	phenyl	H	m-D1	H	phneyl
2255	4-pyridyl	H	m-D1	H	4-pyridyl
2256	Cz	Cz	m-D2	H	phenyl
2257	H	m-D2	Cz	Cz	methyl
2258	m-D2	H	Cz	metoxy	Cz
2259	Cz	methyl	m-D2	phenyl	Cz
2260	m-D2	H	Cz	H	methyl
2261	Cz	methyl	m-D2	H	H
2262	methyl	m-D2	H	Cz	H
2263	m-D2	H	m-D2	Cz	methyl
2264	m-D2	methyl	m-D2	H	Cz
2265	m-D2	H	Cz	methoxy	m-D2
2266	m-D2	H	m-D2	H	methyl
2267	H	m-D2	methyl	m-D2	H
2268	H	m-D2	phenyl	m-D2	H
2269	m-D2	H	methyl	H	m-D2
2270	m-D2	H	phenyl	H	m-D2
2271	m-D2	H	methoxy	H	m-D2
2272	m-D2	methyl	phenyl	methoxy	m-D2
2273	phenyl	H	m-D2	H	phneyl
2274	4-pyridyl	H	m-D2	H	4-pyridyl
2275	Cz	Cz	m-D3	H	phenyl
2276	H	m-D3	Cz	Cz	methyl
2277	m-D3	H	Cz	metoxy	Cz
2278	Cz	methyl	m-D3	phenyl	Cz
2279	m-D3	H	Cz	H	methyl
2280	Cz	methyl	m-D3	H	H
2281	methyl	m-D3	H	Cz	H
2282	m-D3	H	m-D3	Cz	methyl
2283	m-D3	methyl	m-D3	H	Cz
2284	m-D3	H	Cz	methoxy	m-D3
2285	m-D3	H	m-D3	H	methyl
2286	H	m-D3	methyl	m-D3	H
2287	H	m-D3	phenyl	m-D3	H
2288	m-D3	H	methyl	H	m-D3
2289	m-D3	H	phenyl	H	m-D3
2290	m-D3	H	methoxy	H	m-D3
2291	m-D3	methyl	phenyl	methoxy	m-D3
2292	phenyl	H	m-D3	H	phneyl
2293	4-pyridyl	H	m-D3	H	4-pyridyl

TABLE 1-42

No	R^1	R^2	R^3	R^4	R^5
2294	Cz9	Cz9	m-D2	Cz9	Cz9
2295	m-D2	Cz9	Cz9	Cz9	H
2296	Cz9	Cz9	Cz9	m-D2	H
2297	m-D2	Cz9	Cz9	H	Cz9
2298	Cz9	Cz9	m-D2	H	Cz9
2299	Cz9	m-D2	H	Cz9	Cz9
2300	Cz9	m-D2	Cz9	H	H
2301	Cz9	Cz9	m-D2	H	H
2302	H	m-D2	Cz9	Cz9	H
2303	H	Cz9	m-D2	Cz9	H
2304	m-D2	H	Cz9	H	Cz9
2305	Cz9	H	m-D2	H	Cz9
2306	m-D2	Cz9	H	H	H
2307	H	m-D2	H	Cz9	H
2308	m-D2	m-D2	Cz9	H	Cz9
2309	m-D2	Cz9	m-D2	H	Cz9

TABLE 1-42-continued

No	R^1	R^2	R^3	R^4	R^5
2310	Cz9	m-D2	m-D2	H	Cz9
2311	m-D2	m-D2	H	Cz9	Cz9
2312	Cz9	m-D2	H	m-D2	Cz9
2313	m-D2	Cz9	m-D2	H	H
2314	H	m-D2	m-D2	Cz9	H
2315	H	m-D2	Cz9	m-D2	H
2316	m-D2	H	m-D2	H	Cz9
2317	m-D2	H	Cz9	H	m-D2
2318	m-D2	Cz9	m-D2	Cz9	m-D2
2319	m-D2	m-D2	m-D2	Cz9	H
2320	m-D2	m-D2	Cz9	m-D2	H
2321	m-D2	m-D2	m-D2	H	Cz9
2322	m-D2	m-D2	H	m-D2	Cz9
2323	m-D2	m-D2	H	Cz9	m-D2
2324	m-D2	m-D2	m-D2	m-D2	Cz9
2325	Cz9	Cz9	m-D3	Cz9	Cz9
2326	m-D3	Cz9	Cz9	Cz9	H
2327	Cz9	Cz9	Cz9	m-D3	H
2328	m-D3	Cz9	Cz9	H	Cz9
2329	Cz9	Cz9	m-D3	H	Cz9
2330	Cz9	m-D3	H	Cz9	Cz9
2331	Cz9	m-D3	Cz9	H	H
2332	Cz9	Cz9	m-D3	H	H
2333	H	m-D3	Cz9	Cz9	H
2334	H	Cz9	m-D3	Cz9	H
2335	m-D3	H	Cz9	H	Cz9
2336	Cz9	H	m-D3	H	Cz9
2337	m-D3	Cz9	H	H	H
2338	H	m-D3	H	Cz9	H
2339	m-D3	m-D3	Cz9	H	Cz9
2340	m-D3	Cz9	m-D3	H	Cz9
2341	Cz9	m-D3	m-D3	H	Cz9
2342	m-D3	m-D3	H	Cz9	Cz9
2343	Cz9	m-D3	H	m-D3	Cz9
2344	m-D3	Cz9	m-D3	H	H
2345	H	m-D3	m-D3	Cz9	H
2346	H	m-D3	Cz9	m-D3	H
2347	m-D3	H	m-D3	H	Cz9
2348	m-D3	H	Cz9	H	m-D3
2349	m-D3	Cz9	m-D3	Cz9	m-D3
2350	m-D3	m-D3	m-D3	Cz9	H

TABLE 1-43

2351	m-D3	m-D3	Cz9	m-D3	H
2352	m-D3	m-D3	m-D3	H	Cz9
2353	m-D3	m-D3	H	m-D3	Cz9
2354	m-D3	m-D3	H	Cz9	m-D3
2355	m-D3	m-D3	m-D3	m-D3	Cz9
2356	Cz10	Cz10	m-D2	Cz10	Cz10
2357	m-D2	Cz10	Cz10	Cz10	H
2358	Cz10	Cz10	Cz10	m-D2	H
2359	m-D2	Cz10	Cz10	H	Cz10
2360	Cz10	Cz10	m-D2	H	Cz10
2361	Cz10	m-D2	H	Cz10	Cz10
2362	Cz10	m-D2	Cz10	H	H
2363	Cz10	Cz10	m-D2	H	H
2364	H	m-D2	Cz10	Cz10	H
2365	H	Cz10	m-D2	Cz10	H
2366	m-D2	H	Cz10	H	Cz10
2367	Cz10	H	m-D2	H	Cz10
2368	m-D2	Cz10	H	H	H
2369	H	m-D2	H	Cz10	H
2370	m-D2	m-D2	Cz10	H	Cz10
2371	m-D2	Cz10	m-D2	H	Cz10
2372	Cz10	m-D2	m-D2	H	Cz10
2373	m-D2	m-D2	H	Cz10	Cz10
2374	Cz10	m-D2	H	m-D2	Cz10
2375	m-D2	Cz10	m-D2	H	H
2376	H	m-D2	m-D2	Cz10	H
2377	H	m-D2	Cz10	m-D2	H
2378	m-D2	H	m-D2	H	Cz10
2379	m-D2	H	Cz10	H	m-D2
2380	m-D2	Cz10	m-D2	Cz10	m-D2
2381	m-D2	m-D2	m-D2	Cz10	H

TABLE 1-43-continued

2382	m-D2	m-D2	Cz10	m-D2	H
2383	m-D2	m-D2	m-D2	H	Cz10
2384	m-D2	m-D2	H	m-D2	Cz10
2385	m-D2	m-D2	H	Cz10	m-D2
2386	m-D2	m-D2	m-D2	m-D2	Cz10
2387	Cz10	Cz10	m-D3	Cz10	Cz10
2388	m-D3	Cz10	Cz10	Cz10	H
2389	Cz10	Cz10	Cz10	m-D3	H
2390	m-D3	Cz10	Cz10	H	Cz10
2391	Cz10	Cz10	m-D3	H	Cz10
2392	Cz10	m-D3	H	Cz10	Cz10
2393	Cz10	m-D3	Cz10	H	H
2394	Cz10	Cz10	m-D3	H	H
2395	H	m-D3	Cz10	Cz10	H
2396	H	Cz10	m-D3	Cz10	H
2397	m-D3	H	Cz10	H	Cz10
2398	Cz10	H	m-D3	H	Cz10
2399	m-D3	Cz10	H	H	H
2400	H	m-D3	H	Cz10	H
2401	m-D3	m-D3	Cz10	H	Cz10
2402	m-D3	Cz10	m-D3	H	Cz10
2403	Cz10	m-D3	m-D3	H	Cz10
2404	m-D3	m-D3	H	Cz10	Cz10
2405	Cz10	m-D3	H	m-D3	Cz10
2406	m-D3	Cz10	m-D3	H	H
2407	H	m-D3	m-D3	Cz10	H
2408	H	m-D3	Cz10	m-D3	H
2409	m-D3	H	m-D3	H	Cz10

TABLE 1-44

2410	m-D3	H	Cz10	H	m-D3
2411	m-D3	Cz10	m-D3	Cz10	m-D3
2412	m-D3	m-D3	m-D3	Cz10	H
2413	m-D3	m-D3	Cz10	m-D3	H
2414	m-D3	m-D3	m-D3	H	Cz10
2415	m-D3	m-D3	H	m-D3	Cz10
2416	m-D3	m-D3	H	Cz10	m-D3
2417	m-D3	m-D3	m-D3	m-D3	Cz10
2418	Cz11	Cz11	m-D2	Cz11	Cz11
2419	m-D2	Cz11	Cz11	Cz11	H
2420	Cz11	Cz11	Cz11	m-D2	H
2421	m-D2	Cz11	Cz11	H	Cz11
2422	Cz11	Cz11	m-D2	H	Cz11
2423	Cz11	m-D2	H	Cz11	Cz11
2424	Cz11	m-D2	Cz11	H	H
2425	Cz11	Cz11	m-D2	H	H
2426	H	m-D2	Cz11	Cz11	H
2427	H	Cz11	m-D2	Cz11	H
2428	m-D2	H	Cz11	H	Cz11
2429	Cz11	H	m-D2	H	Cz11
2430	m-D2	Cz11	H	H	H
2431	H	m-D2	H	Cz11	H
2432	m-D2	m-D2	Cz11	H	Cz11
2433	m-D2	Cz11	m-D2	H	Cz11
2434	Cz11	m-D2	m-D2	H	Cz11
2435	m-D2	m-D2	H	Cz11	Cz11
2436	Cz11	m-D2	H	m-D2	Cz11
2437	m-D2	Cz11	m-D2	H	H
2438	H	m-D2	m-D2	Cz11	H
2439	H	m-D2	Cz11	m-D2	H
2440	m-D2	H	m-D2	H	Cz11
2441	m-D2	H	Cz11	H	m-D2
2442	m-D2	Cz11	m-D2	Cz11	m-D2
2443	m-D2	m-D2	m-D2	Cz11	H
2444	m-D2	m-D2	Cz11	m-D2	H
2445	m-D2	m-D2	m-D2	H	Cz11
2446	m-D2	m-D2	H	m-D2	Cz11
2447	m-D2	m-D2	H	Cz11	m-D2
2448	m-D2	m-D2	m-D2	m-D2	Cz11
2449	Cz11	Cz11	m-D3	Cz11	Cz11
2450	m-D3	Cz11	Cz11	Cz11	H
2451	Cz11	Cz11	Cz11	m-D3	H
2452	m-D3	Cz11	Cz11	H	Cz11
2453	Cz11	Cz11	m-D3	H	Cz11
2454	Cz11	m-D3	H	Cz11	Cz11
2455	Cz11	m-D3	Cz11	H	H

TABLE 1-44-continued

2456	Cz11	Cz11	m-D3	H	H
2457	H	m-D3	Cz11	Cz11	H
2458	H	Cz11	m-D3	Cz11	H
2459	m-D3	H	Cz11	H	Cz11
2460	Cz11	H	m-D3	H	Cz11
2461	m-D3	Cz11	H	H	H
2462	H	m-D3	H	Cz11	H
2463	m-D3	m-D3	Cz11	H	Cz11
2464	m-D3	Cz11	m-D3	H	Cz11
2465	Cz11	m-D3	m-D3	H	Cz11
2466	m-D3	m-D3	H	Cz11	Cz11
2467	Cz11	m-D3	H	m-D3	Cz11
2468	m-D3	Cz11	m-D3	H	H

TABLE 1-45

2469	H	m-D3	m-D3	Cz11	H
2470	H	m-D3	Cz11	m-D3	H
2471	m-D3	H	m-D3	H	Cz11
2472	m-D3	H	Cz11	H	m-D3
2473	m-D3	Cz11	m-D3	Cz11	m-D3
2474	m-D3	m-D3	m-D3	Cz11	H
2475	m-D3	m-D3	Cz11	m-D3	H
2476	m-D3	m-D3	m-D3	H	Cz11
2477	m-D3	m-D3	H	m-D3	Cz11
2478	m-D3	m-D3	H	Cz11	m-D3
2479	m-D3	m-D3	m-D3	m-D3	Cz11
2480	m-D1	Cz12	Cz12	Cz12	Cz12
2481	Cz12	m-D1	Cz12	Cz12	Cz12
2482	Cz12	Cz12	m-D1	Cz12	Cz12
2483	m-D1	Cz12	Cz12	Cz12	H
2484	Cz12	m-D1	Cz12	Cz12	H
2485	Cz12	Cz12	m-D1	Cz12	H
2486	Cz12	Cz12	Cz12	m-D1	H
2487	m-D1	Cz12	Cz12	H	Cz12
2488	Cz12	m-D1	Cz12	H	Cz12
2489	Cz12	Cz12	m-D1	H	Cz12
2490	Cz12	Cz12	Cz12	H	m-D1
2491	m-D1	Cz12	H	Cz12	Cz12
2492	Cz12	m-D1	H	Cz12	Cz12
2493	m-D1	Cz12	Cz12	H	H
2494	Cz12	m-D1	Cz12	H	H
2495	Cz12	Cz12	m-D1	H	H
2496	m-D1	Cz12	H	Cz12	H
2497	Cz12	m-D1	H	Cz12	H
2498	Cz12	Cz12	H	m-D1	H
2499	m-D1	H	Cz12	Cz12	H
2500	Cz12	H	m-D1	Cz12	H
2501	Cz12	H	Cz12	m-D1	H
2502	H	m-D1	Cz12	Cz12	H
2503	H	Cz12	m-D1	Cz12	H
2504	m-D1	Cz12	H	H	Cz12
2505	Cz12	m-D1	H	H	Cz12
2506	Cz12	Cz12	H	H	m-D1
2507	m-D1	H	Cz12	H	Cz12
2508	Cz12	H	m-D1	H	Cz12
2509	m-D1	Cz12	H	H	H
2510	Cz12	m-D1	H	H	H
2511	m-D1	H	Cz12	H	H
2512	Cz12	H	m-D1	H	H
2513	H	m-D1	Cz12	H	H
2514	H	Cz12	m-D1	H	H
2515	m-D1	H	H	Cz12	H
2516	Cz12	H	H	m-D1	H
2517	H	m-D1	H	Cz12	H
2518	m-D1	H	H	H	Cz12
2519	m-D1	m-D1	Cz12	Cz12	H
2520	m-D1	Cz12	m-D1	Cz12	H
2521	m-D1	Cz12	Cz12	m-D1	H
2522	Cz12	m-D1	m-D1	Cz12	H
2523	Cz12	m-D1	Cz12	m-D1	H
2524	Cz12	Cz12	m-D1	m-D1	H
2525	m-D1	m-D1	Cz12	H	Cz12
2526	m-D1	Cz12	m-D1	H	Cz12
2527	m-D1	Cz12	Cz12	H	m-D1

TABLE 1-46

2528	Cz12	m-D1	m-D1	H	Cz12
2529	Cz12	m-D1	Cz12	H	m-D1
2530	Cz12	Cz12	m-D1	H	m-D1
2531	m-D1	m-D1	H	Cz12	Cz12
2532	m-D1	Cz12	H	m-D1	Cz12
2533	m-D1	Cz12	H	Cz12	m-D1
2534	Cz12	m-D1	H	m-D1	Cz12
2535	m-D1	m-D1	Cz12	H	H
2536	m-D1	Cz12	m-D1	H	H
2537	Cz12	m-D1	m-D1	H	H
2538	m-D1	m-D1	H	Cz12	H
2539	m-D1	Cz12	H	m-D1	H
2540	Cz12	m-D1	H	m-D1	H
2541	m-D1	H	m-D1	Cz12	H
2542	m-D1	H	Cz12	m-D1	H
2543	Cz12	H	m-D1	m-D1	H
2544	H	m-D1	m-D1	Cz12	H
2545	H	m-D1	Cz12	m-D1	H
2546	m-D1	m-D1	H	H	Cz12
2547	m-D1	Cz12	H	H	m-D1
2548	Cz12	m-D1	H	H	m-D1
2549	m-D1	H	m-D1	H	Cz12
2550	m-D1	H	Cz12	H	m-D1
2551	m-D1	m-D1	m-D1	Cz12	Cz12
2552	m-D1	m-D1	Cz12	m-D1	Cz12
2553	m-D1	m-D1	Cz12	Cz12	m-D1
2554	m-D1	Cz12	m-D1	m-D1	Cz12
2555	m-D1	Cz12	m-D1	Cz12	m-D1
2556	m-D1	m-D1	m-D1	Cz12	H
2557	m-D1	m-D1	Cz12	m-D1	H
2558	m-D1	Cz12	m-D1	Cz12	H
2559	Cz12	m-D1	m-D1	m-D1	H
2560	m-D1	m-D1	m-D1	H	Cz12
2561	m-D1	m-D1	Cz12	H	m-D1
2562	m-D1	Cz12	m-D1	H	m-D1
2563	Cz12	m-D1	m-D1	H	m-D1
2564	m-D1	m-D1	H	m-D1	Cz12
2565	m-D1	m-D1	H	Cz12	m-D1
2566	m-D1	m-D1	m-D1	m-D1	Cz12
2567	m-D1	m-D1	m-D1	Cz12	m-D1
2568	m-D1	m-D1	Cz12	m-D1	m-D1
2569	m-D2	Cz12	Cz12	Cz12	Cz12
2570	Cz12	m-D2	Cz12	Cz12	Cz12
2571	Cz12	Cz12	m-D2	Cz12	Cz12
2572	m-D2	Cz12	Cz12	Cz12	H
2573	Cz12	m-D2	Cz12	Cz12	H
2574	Cz12	Cz12	m-D2	Cz12	H
2575	Cz12	Cz12	Cz12	m-D2	H
2576	m-D2	Cz12	Cz12	H	Cz12
2577	Cz12	m-D2	Cz12	H	Cz12
2578	Cz12	Cz12	m-D2	H	Cz12
2579	Cz12	Cz12	Cz12	H	m-D2
2580	m-D2	Cz12	H	Cz12	Cz12
2581	Cz12	m-D2	H	Cz12	Cz12
2582	m-D2	Cz12	Cz12	H	H
2583	Cz12	m-D2	Cz12	H	H
2584	Cz12	Cz12	m-D2	H	H
2585	m-D2	Cz12	H	Cz12	H
2586	Cz12	m-D2	H	Cz12	H

TABLE 1-47

2587	Cz12	Cz12	H	m-D2	H
2588	m-D2	H	Cz12	Cz12	H
2589	Cz12	H	m-D2	Cz12	H
2590	Cz12	H	Cz12	m-D2	H
2591	H	m-D2	Cz12	Cz12	H
2592	H	Cz12	m-D2	Cz12	H
2593	m-D2	Cz12	H	H	Cz12
2594	Cz12	m-D2	H	H	Cz12
2595	Cz12	Cz12	H	H	m-D2
2596	m-D2	H	Cz12	H	Cz12
2597	Cz12	H	m-D2	H	Cz12
2598	m-D2	Cz12	H	H	H
2599	Cz12	m-D2	H	H	H
2600	m-D2	H	Cz12	H	H
2601	Cz12	H	m-D2	H	H

TABLE 1-47-continued

2602	H	m-D2	Cz12	H	H
2603	H	Cz12	m-D2	H	H
2604	m-D2	H	H	Cz12	H
2605	Cz12	H	H	m-D2	H
2606	H	m-D2	H	Cz12	H
2607	m-D2	H	H	H	Cz12
2608	m-D2	m-D2	Cz12	Cz12	H
2609	m-D2	Cz12	m-D2	Cz12	H
2610	m-D2	Cz12	Cz12	m-D2	H
2611	Cz12	m-D2	m-D2	Cz12	H
2612	Cz12	m-D2	Cz12	m-D2	H
2613	Cz12	Cz12	m-D2	m-D2	H
2614	m-D2	m-D2	Cz12	H	Cz12
2615	m-D2	Cz12	m-D2	H	Cz12
2616	m-D2	Cz12	Cz12	H	m-D2
2617	Cz12	m-D2	m-D2	H	Cz12
2618	Cz12	m-D2	Cz12	H	m-D2
2619	Cz12	Cz12	m-D2	H	m-D2
2620	m-D2	m-D2	H	Cz12	Cz12
2621	m-D2	Cz12	H	m-D2	Cz12
2622	m-D2	Cz12	H	Cz12	m-D2
2623	Cz12	m-D2	H	m-D2	Cz12
2624	m-D2	m-D2	Cz12	H	H
2625	m-D2	Cz12	m-D2	H	H
2626	Cz12	m-D2	m-D2	H	H
2627	m-D2	m-D2	H	Cz12	H
2628	m-D2	Cz12	H	m-D2	H
2629	Cz12	m-D2	H	m-D2	H
2630	m-D2	H	m-D2	Cz12	H
2631	m-D2	H	Cz12	m-D2	H
2632	Cz12	H	m-D2	m-D2	H
2633	H	m-D2	m-D2	Cz12	H
2634	H	m-D2	Cz12	m-D2	H
2635	m-D2	m-D2	H	H	Cz12
2636	m-D2	Cz12	H	H	m-D2
2637	Cz12	m-D2	H	H	m-D2
2638	m-D2	H	m-D2	H	Cz12
2639	m-D2	H	Cz12	H	m-D2
2640	m-D2	m-D2	m-D2	Cz12	Cz12
2641	m-D2	m-D2	Cz12	m-D2	Cz12
2642	m-D2	m-D2	Cz12	Cz12	m-D2
2643	m-D2	Cz12	m-D2	m-D2	Cz12
2644	m-D2	Cz12	m-D2	Cz12	m-D2
2645	m-D2	m-D2	m-D2	Cz12	H

TABLE 1-48

2646	m-D2	m-D2	Cz12	m-D2	H
2647	m-D2	Cz12	m-D2	Cz12	H
2648	Cz12	m-D2	m-D2	m-D2	H
2649	m-D2	m-D2	m-D2	H	Cz12
2650	m-D2	m-D2	Cz12	H	m-D2
2651	m-D2	Cz12	m-D2	H	m-D2
2652	Cz12	m-D2	m-D2	H	m-D2
2653	m-D2	m-D2	H	m-D2	Cz12
2654	m-D2	m-D2	H	Cz12	m-D2
2655	m-D2	m-D2	m-D2	m-D2	Cz12
2656	m-D2	m-D2	m-D2	Cz12	m-D2
2657	m-D2	m-D2	Cz12	m-D2	m-D2
2658	m-D3	Cz12	Cz12	Cz12	Cz12
2659	Cz12	m-D3	Cz12	Cz12	Cz12
2660	Cz12	Cz12	m-D3	Cz12	Cz12
2661	m-D3	Cz12	Cz12	Cz12	H
2662	Cz12	m-D3	Cz12	Cz12	H
2663	Cz12	Cz12	m-D3	Cz12	H
2664	Cz12	Cz12	Cz12	m-D3	H
2665	m-D3	Cz12	Cz12	H	Cz12
2666	Cz12	m-D3	Cz12	H	Cz12
2667	Cz12	Cz12	m-D3	H	Cz12
2668	Cz12	Cz12	Cz12	H	m-D3
2669	m-D3	Cz12	H	Cz12	Cz12
2670	Cz12	m-D3	H	Cz12	Cz12
2671	m-D3	Cz12	Cz12	H	H
2672	Cz12	m-D3	Cz12	H	H
2673	Cz12	Cz12	m-D3	H	H
2674	m-D3	Cz12	H	Cz12	H
2675	Cz12	m-D3	H	Cz12	H

TABLE 1-48-continued

2676	Cz12	Cz12	H	m-D3	H
2677	m-D3	H	Cz12	Cz12	H
2678	Cz12	H	m-D3	Cz12	H
2679	Cz12	H	Cz12	m-D3	H
2680	H	m-D3	Cz12	Cz12	H
2681	H	Cz12	m-D3	Cz12	H
2682	m-D3	Cz12	H	H	Cz12
2683	Cz12	m-D3	H	H	Cz12
2684	Cz12	Cz12	H	H	m-D3
2685	m-D3	H	Cz12	H	Cz12
2686	Cz12	H	m-D3	H	Cz12
2687	m-D3	Cz12	H	H	H
2688	Cz12	m-D3	H	H	H
2689	m-D3	H	Cz12	H	H
2690	Cz12	H	m-D3	H	H
2691	H	m-D3	Cz12	H	H
2692	H	Cz12	m-D3	H	H
2693	m-D3	H	H	Cz12	H
2694	Cz12	H	H	m-D3	H
2695	H	m-D3	H	Cz12	H
2696	m-D3	H	H	H	Cz12
2697	m-D3	m-D3	Cz12	Cz12	H
2698	m-D3	Cz12	m-D3	Cz12	H
2699	m-D3	Cz12	Cz12	m-D3	H
2700	Cz12	m-D3	m-D3	Cz12	H
2701	Cz12	m-D3	Cz12	m-D3	H
2702	Cz12	Cz12	m-D3	m-D3	H
2703	m-D3	m-D3	Cz12	H	Cz12
2704	m-D3	Cz12	m-D3	H	Cz12

TABLE 1-49

2705	m-D3	Cz12	Cz12	H	m-D3
2706	Cz12	m-D3	m-D3	H	Cz12
2707	Cz12	m-D3	Cz12	H	m-D3
2708	Cz12	Cz12	m-D3	H	m-D3
2709	m-D3	m-D3	H	Cz12	Cz12
2710	m-D3	Cz12	H	m-D3	Cz12
2711	m-D3	Cz12	H	Cz12	m-D3
2712	Cz12	m-D3	H	m-D3	Cz12
2713	m-D3	m-D3	Cz12	H	H
2714	m-D3	Cz12	m-D3	H	H
2715	Cz12	m-D3	m-D3	H	H
2716	m-D3	m-D3	H	Cz12	H
2717	m-D3	Cz12	H	m-D3	H
2718	Cz12	m-D3	H	m-D3	H
2719	m-D3	H	m-D3	Cz12	H
2720	m-D3	H	Cz12	m-D3	H
2721	Cz12	H	m-D3	m-D3	H
2722	H	m-D3	m-D3	Cz12	H
2723	H	m-D3	Cz12	m-D3	H
2724	m-D3	m-D3	H	H	Cz12
2725	m-D3	Cz12	H	H	m-D3
2726	Cz12	m-D3	H	H	m-D3
2727	m-D3	H	m-D3	H	Cz12
2728	m-D3	H	Cz12	H	m-D3
2729	m-D3	m-D3	m-D3	Cz12	Cz12
2730	m-D3	m-D3	Cz12	m-D3	Cz12
2731	m-D3	m-D3	Cz12	Cz12	m-D3
2732	m-D3	Cz12	m-D3	m-D3	Cz12
2733	m-D3	Cz12	m-D3	Cz12	m-D3
2734	m-D3	m-D3	m-D3	Cz12	H
2735	m-D3	m-D3	Cz12	m-D3	H
2736	m-D3	Cz12	m-D3	Cz12	H
2737	Cz12	m-D3	m-D3	m-D3	H
2738	m-D3	m-D3	m-D3	H	Cz12
2739	m-D3	m-D3	Cz12	H	m-D3
2740	m-D3	Cz12	m-D3	H	m-D3
2741	Cz12	m-D3	m-D3	H	m-D3
2742	m-D3	m-D3	H	m-D3	Cz12
2743	m-D3	m-D3	H	Cz12	m-D3
2744	m-D3	m-D3	m-D3	m-D3	Cz12
2745	m-D3	m-D3	m-D3	Cz12	m-D3
2746	m-D3	m-D3	Cz12	m-D3	m-D3

TABLE 1-50

No	R^1	R^2	R^3	R^4	R^5
2747	F	Cz	m-D1	Cz	Cz
2748	Cz	F	m-D1	Cz	Cz
2749	Cz	F	m-D1	F	Cz
2750	Cz	F	m-D1	F	F
2751	Cz	F	m-D1	Cz	H
2752	Cz	F	m-D1	F	H
2753	F	Cz	m-D1	Cz	H
2754	F	F	m-D1	Cz	H
2755	F	Cz	m-D1	H	Cz
2756	Cz	F	m-D1	H	Cz
2757	F	F	m-D1	H	Cz
2758	F	Cz	m-D1	H	F
2759	F	H	m-D1	H	Cz
2760	F	Cz	m-D2	Cz	Cz
2761	Cz	F	m-D2	Cz	Cz
2762	Cz	F	m-D2	F	Cz
2763	Cz	F	m-D2	F	F
2764	Cz	F	m-D2	Cz	H
2765	Cz	F	m-D2	F	H
2766	F	Cz	m-D2	Cz	H
2767	F	F	m-D2	Cz	H
2768	F	Cz	m-D2	H	Cz
2769	Cz	F	m-D2	H	Cz
2770	F	F	m-D2	H	Cz
2771	F	Cz	m-D2	H	F
2772	F	H	m-D2	H	Cz
2773	F	Cz	m-D3	Cz	Cz
2774	Cz	F	m-D3	Cz	Cz
2775	Cz	F	m-D3	F	Cz
2776	Cz	F	m-D3	F	F
2777	Cz	F	m-D3	Cz	H
2778	Cz	F	m-D3	F	H
2779	F	Cz	m-D3	Cz	H
2780	F	F	m-D3	Cz	H
2781	F	Cz	m-D3	H	Cz
2782	Cz	F	m-D3	H	Cz
2783	F	F	m-D3	H	Cz
2784	F	Cz	m-D3	H	F
2785	F	H	m-D3	H	Cz

The molecular weight of the compound represented by the general formula (1) is preferably 1,500 or less, more preferably 1,200 or less, further preferably 1,000 or less, and still further preferably 800 or less, for example, in the case where an organic layer containing the compound represented by the general formula (1) is intended to be formed as a film by a vapor deposition method. The lower limit of the molecular weight is the molecular weight of the smallest compound represented by the general formula (1).

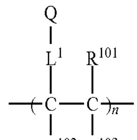
The compound represented by the general formula (1) may be formed into a film by a coating method irrespective of the molecular weight thereof. The compound that has a relatively large molecular weight may be formed into a film by a coating method.

As an application of the present invention, it may be considered that a compound that contains plural structures each represented by the general formula (1) in the molecule is used as a light-emitting material.

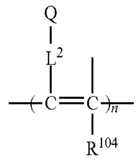
For example, it may be considered that a polymerizable group is introduced in advance to the structure represented by the general formula (1), and a polymer obtained by polymerizing the polymerizable group is used as a light-emitting material. Specifically, it may be considered that a monomer that has a polymerizable functional group at any of R^1 to R^5 in the general formula (1) is prepared, and is homopolymerized or copolymerized with another monomer to prepare a polymer containing repeating units, and the polymer is used as a light-emitting material. In alternative, it may be considered that the compounds represented by the general formula (1) are coupled with each other to form a dimer or a trimer, and the dimer or the trimer is used as a light-emitting material.

Examples of the polymer having the repeating unit containing the structure represented by the general formula (1) include a polymer containing a structure represented by the following general formula (11) or (12).

General Formula (11)



General Formula (12)



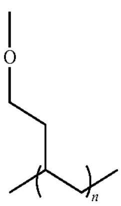
In the general formulae (11) and (12), Q represents a group containing the structure represented by the general formula (1), and L^1 and L^2 each represent a linking group. The linking group preferably has a number of carbon atoms of from 0 to 20, more preferably from 1 to 15, and further preferably from 2 to 10. The linking group preferably has a structure represented by —X^{11}-L^{11}-, wherein X^{11} represents an oxygen atom or a sulfur atom, and preferably an oxygen atom, and L^{11} represents a linking group, preferably a substituted or unsubstituted alkylene group or a substituted or unsubstituted arylene group, and more preferably a substituted or unsubstituted alkylene group having from 1 to 10 carbon atoms or a substituted or unsubstituted phenylene group.

In the general formulae (11) and (12), R^{101}, R^{102}, R^{103} and R^{104} each independently represent a substituent, preferably a substituted or unsubstituted alkyl group having from 1 to 6 carbon atoms, a substituted or unsubstituted alkoxy group having from 1 to 6 carbon atoms, or a halogen atom, more preferably an unsubstituted alkyl group having from 1 to 3 carbon atoms, an unsubstituted alkoxy group having from 1 to 3 carbon atoms, a fluorine atom, or a chlorine atom, and further preferably an unsubstituted alkyl group having from 1 to 3 carbon atoms or an unsubstituted alkoxy group having from 1 to 3 carbon atoms.

The linking group represented by L^1 and L^2 may be bonded to any of R^1 to R^5 of the structure of the general formula (1) constituting Q. Two or more of the linking groups may be boded to one group represented by Q to form a crosslinked structure or a network structure.

Specific examples of the structure of the repeating unit include structures represented by the following formulae (13) to (16).

Formula (13)



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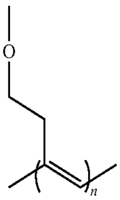
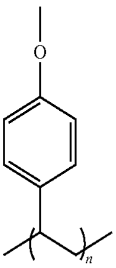
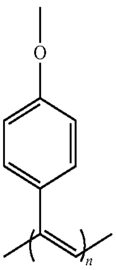
Formula (14)



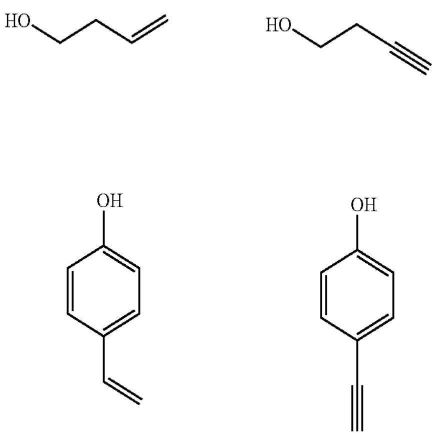
Formula (15)



Formula (16)



The polymer having the repeating unit containing the structure represented by any of the formulae (13) to (16) may be synthesized in such a manner that a hydroxyl group is introduced to any of R^1 to R^5 in the structure represented by the general formula (1), and the hydroxyl group as a linker is reacted with the following compound to introduce a polymerizable group thereto, followed by polymerizing the polymerizable group.



The polymer containing the structure represented by the general formula (1) in the molecule may be a polymer containing only a repeating unit having the structure represented by the general formula (1), or a polymer further containing a repeating unit having another structure. The repeating unit having the structure represented by the general formula (1) contained in the polymer may be only one kind or two or more kinds. Examples of the repeating unit that does not have the structure represented by the general

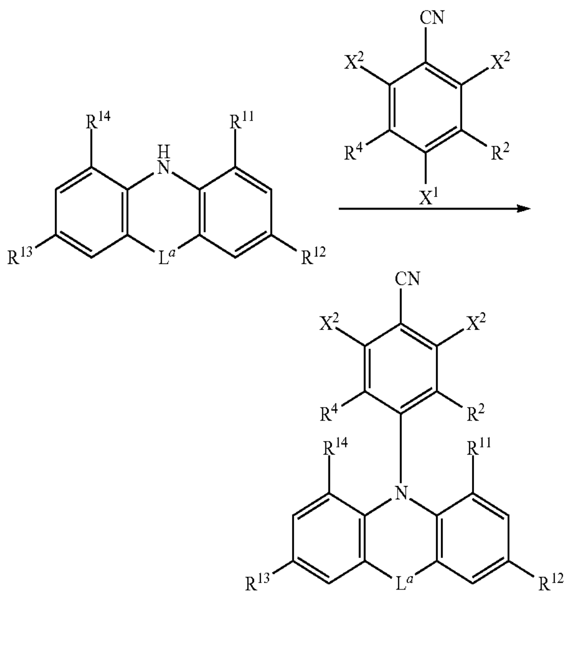
formula (1) include a repeating unit derived from a monomer that is used for ordinary copolymerization. Examples of the repeating unit include a repeating unit derived from a monomer having an ethylenic unsaturated bond, such as ethylene and styrene.

Synthesis Method of Compound Represented by General Formula (1)

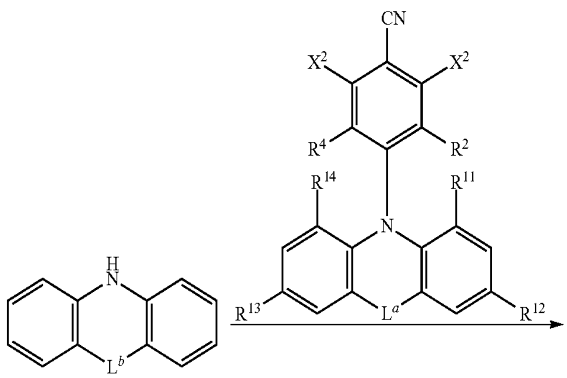
The compound represented by the general formula (1) is a novel compound.

The compound represented by the general formula (1) may be synthesized by combining the known reactions. For example, the compound represented by the general formula (1), wherein R^1 and R^5 each represent an unsubstituted 9-carbazolyl group, an unsubstituted 10-phenoxazyl group or an unsubstituted 10-phenothiazyl group, and R^3 represents a 9-carbazolyl group having substitutes at the 1-position, the 3-position, the 6-position and the 8-position, a 10-phenoxazyl group having substitutes at the 1-position, the 3-position, the 7-position and the 9-position or a 10-phenothiazyl group having substitutes at the 1-position, the 3-position, the 7-position and the 9-position, may be synthesized by following reactions (I), (II).

(I)



(II)



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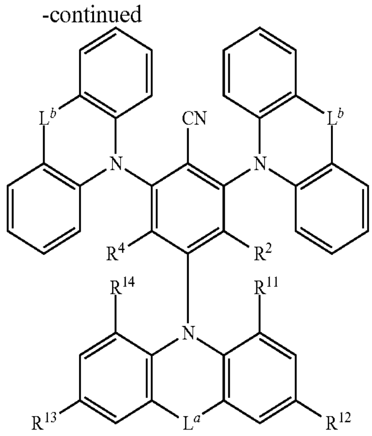


For the descriptions of R^2 and R^4 in the aforementioned reaction scheme, reference may be made to the corresponding description in the general formula (1). R^{11} to R^{14} each independently represent a substituent. L^a and L^b each represent a single bond, an oxygen atom, or a sulfur atom. X^1 and X^2 each independently represent a halogen atom, examples of which include a fluorine atom, a chlorine atom, a bromine atom, and an iodine atom, and X^1 is preferably a bromine atom, and X^2 is preferably a fluorine atom.

The aforementioned reaction is an application of the known coupling reaction, and the known reaction conditions may be appropriately selected and used. For the details of the reaction, reference may be made to Synthesis Examples described later. The compound represented by the general formula (1) may be synthesized by combining the other known synthesis reactions.

Organic Light-emitting Device

The compound represented by the general formula (1) of the invention is useful as a light-emitting material of an organic light-emitting device. Accordingly, the compound represented by the general formula (1) of the invention may be effectively used as a light-emitting material in a light-emitting layer of an organic light-emitting device. The compound represented by the general formula (1) may also be used as a host or assist dopant.

The compound represented by the general formula (1) includes a delayed fluorescent material emitting delayed fluorescent light. Therefore, the invention provides an invention relating to a delayed fluorescent material having a structure represented by the general formula (1), an invention relating to use of the compound represented by the general formula (1) as a delayed fluorescent material, and an invention relating to a method for emitting delayed fluorescent light with the compound represented by the general formula (1). An organic light-emitting device that uses the compound as a light-emitting material has features that the device emits delayed fluorescent light and has a high light emission efficiency. The principle of the features may be described as follows for an organic electroluminescent device as an example.

In an organic electroluminescent device, carriers are injected from both an anode and a cathode to a light-emitting material to form an excited state for the light-emitting material, with which light is emitted. In the case of a carrier injection type organic electroluminescent device, in general, excitons that are excited to the excited singlet state are 25% of the total excitons generated, and the remaining 75% thereof are excited to the excited triplet state. Accordingly, the use of phosphorescence, which is light emission from the excited triplet state, provides a high energy use efficiency. However, the excited triplet state has a long lifetime and thus causes saturation of the excited state and deactivation of energy through mutual action with the excitons in the excited triplet state, and therefore the quantum yield of phosphorescence may generally be often not high. On the other hand, a delayed fluorescent material emits fluorescent light through the mechanism that the energy of excitons transits to the excited triplet state through intersystem crossing or the like, and then transits to the excited singlet state through reverse intersystem crossing due to triplet-triplet annihilation or absorption of thermal energy, thereby emitting fluorescent light. It is considered that a thermal activation type delayed fluorescent material emitting light through absorption of thermal energy is particularly useful for an organic electroluminescent device. In the case where a delayed fluorescent material is used in an organic electroluminescent device, the excitons in the excited singlet state normally emit fluorescent light. On the other hand, the excitons in the excited triplet state emit fluorescent light through intersystem crossing to the excited singlet state by absorbing the heat generated by the device. At this time, the light emitted through reverse intersystem crossing from the excited triplet state to the excited singlet state has the same wavelength as fluorescent light since it is light emission from the excited singlet state, but has a longer lifetime (light emission lifetime) than the normal fluorescent light and phosphorescent light, and thus the light is observed as fluorescent light that is delayed from the normal fluorescent light and phosphorescent light. The light may be defined as delayed fluorescent light. The use of the thermal activation type exciton transition mechanism may raise the proportion of the compound in the excited singlet state, which is generally formed in a proportion only of 25%, to 25% or more through the absorption of the thermal energy after the carrier injection. A compound that emits strong fluorescent light and delayed fluorescent light at a low temperature of lower than 100° C. undergoes the intersystem crossing from the excited triplet state to the excited singlet state sufficiently with the heat of the device, thereby emitting delayed fluorescent light, and thus the use of the compound may drastically enhance the light emission efficiency.

The use of the compound represented by the general formula (1) of the invention as a light-emitting material of a light-emitting layer may provide an excellent organic light-emitting device, such as an organic photoluminescent device (organic PL device) and an organic electroluminescent device (organic EL device). The organic photoluminescent device has a structure containing a substrate having formed thereon at least a light-emitting layer. The organic electroluminescent device has a structure containing at least an anode, a cathode, and an organic layer formed between the anode and the cathode. The organic layer contains at least a light-emitting layer, and may be formed only of a light-emitting layer, or may have one or more organic layer in addition to the light-emitting layer. Examples of the organic layer include a hole transporting layer, a hole injection layer, an electron barrier layer, a hole barrier layer, an electron injection layer, an electron transporting layer, and an exciton barrier layer. The hole transporting layer may be a hole injection and transporting layer having a hole injection function, and the electron transporting layer may be an electron injection and transporting layer having an electron injection function. A specific structural example of an organic electroluminescent device is shown in FIG. **1**. In FIG. **1**, the numeral **1** denotes a substrate, **2** denotes an anode, **3** denotes a hole injection layer, **4** denotes a hole transporting layer, **5** denotes a light-emitting layer, **6** denotes an electron transporting layer, and **7** denotes a cathode.

The members and the layers of the organic electroluminescent device will be described below. The descriptions for the substrate and the light-emitting layer may also be applied to the substrate and the light-emitting layer of the organic photoluminescent device.

Substrate

The organic electroluminescent device of the invention is preferably supported by a substrate. The substrate is not particularly limited and may be one that has been commonly used in an organic electroluminescent device, and examples thereof used include those formed of glass, transparent plastics, quartz and silicon.

Anode

The anode of the organic electroluminescent device used is preferably formed of, as an electrode material, a metal, an alloy, or an electroconductive compound each having a large work function (4 eV or more), or a mixture thereof. Specific examples of the electrode material include a metal, such as Au, and an electroconductive transparent material, such as CuI, indium tin oxide (ITO), SnO_2 and ZnO. A material that is amorphous and is capable of forming a transparent electroconductive film, such as IDIXO (In_2O_3—ZnO), may also be used. The anode may be formed in such a manner that the electrode material is formed into a thin film by such a method as vapor deposition or sputtering, and the film is patterned into a desired pattern by a photolithography method, or in the case where the pattern may not require high accuracy (for example, approximately 100 μm or more), the pattern may be formed with a mask having a desired shape on vapor deposition or sputtering of the electrode material. In alternative, in the case where a material capable of being coated, such as an organic electroconductive compound, is used, a wet film forming method, such as a printing method and a coating method, may be used. In the case where emitted light is to be taken out through the anode, the anode preferably has a transmittance of more than 10%, and the anode preferably has a sheet resistance of several hundred ohm per square or less. The thickness of the anode may be generally selected from a range of from 10 to 1,000 nm, and preferably from 10 to 200 nm, while depending on the material used.

Cathode

The cathode is preferably formed of as an electrode material a metal (which is referred to as an electron injection metal), an alloy, or an electroconductive compound, having a small work function (4 eV or less), or a mixture thereof. Specific examples of the electrode material include sodium, a sodium-potassium alloy, magnesium, lithium, a magnesium-copper mixture, a magnesium-silver mixture, a magnesium-aluminum mixture, a magnesium-indium mixture, an aluminum-aluminum oxide (Al_2O_3) mixture, indium, a lithium-aluminum mixture, and a rare earth metal. Among these, a mixture of an electron injection metal and a second metal that is a stable metal having a larger work function than the electron injection metal, for example, a magnesium-silver mixture, a magnesium-aluminum mixture, a magnesium-indium mixture, an aluminum-aluminum oxide (Al_2O_3) mixture, a lithium-aluminum mixture, and aluminum, is preferred from the standpoint of the electron injection property and the durability against oxidation and the like. The cathode may be produced by forming the electrode material into a thin film by such a method as vapor deposition or sputtering. The cathode preferably has a sheet resistance of several hundred ohm per square or less, and the thickness thereof may be generally selected from a range of from 10 nm to 5 μm, and preferably from 50 to 200 nm. For transmitting the emitted light, any one of the anode and the cathode of the organic electroluminescent device is preferably transparent or translucent, thereby enhancing the light emission luminance.

The cathode may be formed with the electroconductive transparent materials described for the anode, thereby forming a transparent or translucent cathode, and by applying the cathode, a device having an anode and a cathode, both of which have transmittance, may be produced.

Light-emitting Layer

The light-emitting layer is a layer, in which holes and electrons injected from the anode and the cathode respectively are recombined to form excitons, and then the layer emits light. A light-emitting material may be solely used as the light-emitting layer, but the light-emitting layer preferably contains a light-emitting material and a host material. The light-emitting material used may be one kind or two or more kinds selected from the group of compounds represented by the general formula (1) of the invention. In order that the organic electroluminescent device and the organic photoluminescent device of the invention exhibit a high light emission efficiency, it is important that the singlet excitons and the triplet excitons generated in the light-emitting material are confined in the light-emitting material. Accordingly, a host material is preferably used in addition to the light-emitting material in the light-emitting layer. The host material used may be an organic compound that has excited singlet energy and excited triplet energy, at least one of which is higher than those of the light-emitting material of the invention. As a result, the singlet excitons and the triplet excitons generated in the light-emitting material of the invention are capable of being confined in the molecules of the light-emitting material of the invention, thereby eliciting the light emission efficiency thereof sufficiently. Even though the singlet excitons and the triplet excitons are not confined sufficiently, a high light emission efficiency may be obtained in some cases, and thus a host material that is capable of achieving a high light emission efficiency may be used in the invention without any particular limitation. In the organic light-emitting device and the organic electroluminescent device of the invention, the light emission occurs in the light-emitting material of the invention contained in the light-emitting layer. The emitted light contains both fluorescent light and delayed fluorescent light. However, a part of the emitted light may contain emitted light from the host material, or the emitted light may partially contain emitted light from the host material.

In the case where the host material is used, the amount of the compound of the invention as the light-emitting material contained in the light-emitting layer is preferably 0.1% by weight or more, and more preferably 1% by weight or more, and is preferably 50% by weight or less, more preferably 20% by weight or less, and further preferably 10% by weight or less.

The host material in the light-emitting layer is preferably an organic compound that has a hole transporting capability and an electron transporting capability, prevents the emitted light from being increased in wavelength, and has a high glass transition temperature.

Injection Layer

The injection layer is a layer that is provided between the electrode and the organic layer, for decreasing the driving voltage and enhancing the light emission luminance, and includes a hole injection layer and an electron injection layer, which may be provided between the anode and the light-emitting layer or the hole transporting layer and between the cathode and the light-emitting layer or the electron transporting layer. The injection layer may be provided depending on necessity.

Barrier Layer

The barrier layer is a layer that is capable of inhibiting charges (electrons or holes) and/or excitons present in the light-emitting layer from being diffused outside the light-emitting layer. The electron barrier layer may be disposed between the light-emitting layer and the hole transporting layer, and inhibits electrons from passing through the light-emitting layer toward the hole transporting layer. Similarly, the hole barrier layer may be disposed between the light-emitting layer and the electron transporting layer, and inhibits holes from passing through the light-emitting layer toward the electron transporting layer. The barrier layer may also be used for inhibiting excitons from being diffused outside the light-emitting layer. Accordingly, the electron barrier layer and the hole barrier layer each may also have a function as an exciton barrier layer. The electron barrier layer or the exciton barrier layer referred in the description herein is intended to include a layer that has both the functions of an electron barrier layer and an exciton barrier layer by one layer.

Hole Barrier Layer

The hole barrier layer has the function of an electron transporting layer in a broad sense. The hole barrier layer has a function of inhibiting holes from reaching the electron transporting layer while transporting electrons, and thereby enhances the recombination probability of electrons and holes in the light-emitting layer. As the material for the hole barrier layer, the materials for the electron transporting layer described later may be used depending on necessity.

Electron Barrier Layer

The electron barrier layer has the function of transporting holes in a broad sense. The electron barrier layer has a function of inhibiting electrons from reaching the hole transporting layer while transporting holes, and thereby enhances the recombination probability of electrons and holes in the light-emitting layer.

Exciton Barrier Layer

The exciton barrier layer is a layer for inhibiting excitons generated through the recombination of holes and electrons in the light-emitting layer from being diffused to the charge transporting layer, and the use of the layer inserted enables effective confinement of excitons in the light-emitting layer, and thereby enhances the light emission efficiency of the device. The exciton barrier layer may be inserted adjacent to the light-emitting layer on any of the side of the anode and the side of the cathode, and on both the sides. Specifically, in the case where the exciton barrier layer is present on the side of the anode, the layer may be inserted between the hole transporting layer and the light-emitting layer and adjacent to the light-emitting layer, and in the case where the layer is inserted on the side of the cathode, the layer may be inserted between the light-emitting layer and the cathode and adjacent to the light-emitting layer. Between the anode and the exciton barrier layer that is adjacent to the light-emitting layer on the side of the anode, a hole injection layer, an electron barrier layer, and the like may be provided, and between the cathode and the exciton barrier layer that is adjacent to the light-emitting layer on the side of the cathode, an electron injection layer, an electron transporting layer, a hole barrier layer, and the like may be provided. In the case where the barrier layer is provided, the material used for the barrier layer preferably has excited singlet energy and excited triplet energy, at least one of which is higher than the excited singlet energy and the excited triplet energy of the light-emitting layer, respectively.

Hole Transporting Layer

The hole transporting layer is formed of a hole transporting material having a function of transporting holes, and the hole transporting layer may be provided as a single layer or plural layers.

The hole transporting material has one of injection or transporting property of holes and barrier property of electrons, and may be any of an organic material and an inorganic material. Examples of known hole transporting materials that can be used herein include a triazole derivative, an oxadiazole derivative, an imidazole derivative, a carbazole derivative, an indolocarbazole derivative, a polyarylalkane derivative, a pyrazoline derivative, a pyrazolone derivative, a phenylenediamine derivative, an arylamine derivative, an amino-substituted chalcone derivative, an oxazole derivative, a styrylanthracene derivative, a fluorenone derivative, a hydrazone derivative, a stilbene derivative, a silazane derivative, an aniline copolymer, and an electroconductive polymer oligomer, particularly a thiophene oligomer. Among these, a porphyrin compound, an aromatic tertiary amine compound, and a styrylamine compound are preferably used, and an aromatic tertiary amine compound is more preferably used.

Electron Transporting Layer

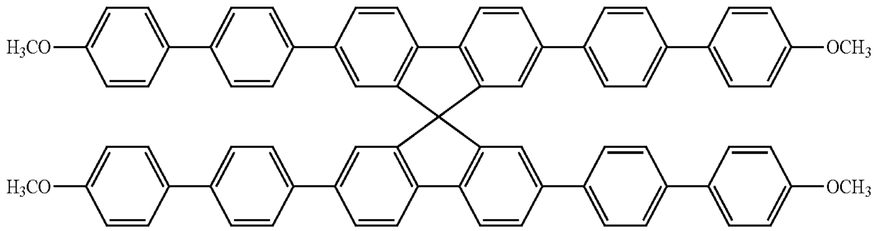
The electron transporting layer is formed of a material having a function of transporting electrons, and the electron transporting layer may be provided as a single layer or plural layers.

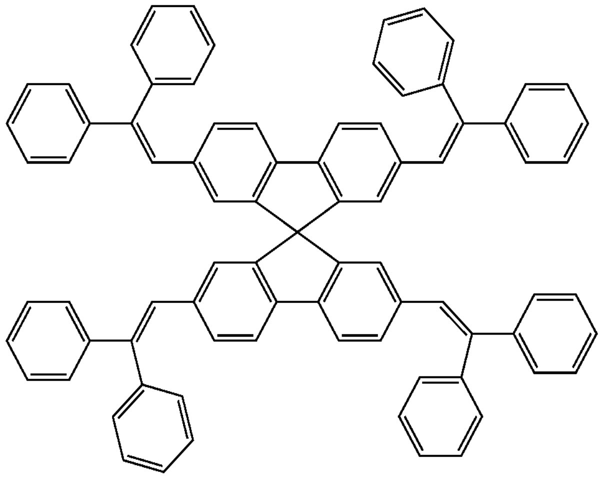
The electron transporting material (which may also function as a hole barrier material in some cases) suffices to have a function of transporting electrons, which are injected from the cathode, to the light-emitting layer. Examples of the electron transporting layer that may be used herein include a nitro-substituted fluorene derivative, a diphenylquinone derivative, a thiopyran dioxide derivative, carbodiimide, a fluorenylidene methane derivative, anthraquinodimethane and an anthrone derivative, and an oxadiazole derivative. Further, regarding the aforementioned oxadiazole derivative, the electron transporting material used may be a thiadiazole derivative obtained by replacing the oxygen atom of the oxadiazole ring of the oxadiazole derivative by a sulfur atom, or a quinoxaline derivative having a quinoxaline ring, which is known as an electron attracting group. Furthermore, polymer materials having these materials introduced to the polymer chain or having these materials used as the main chain of the polymer may also be used.

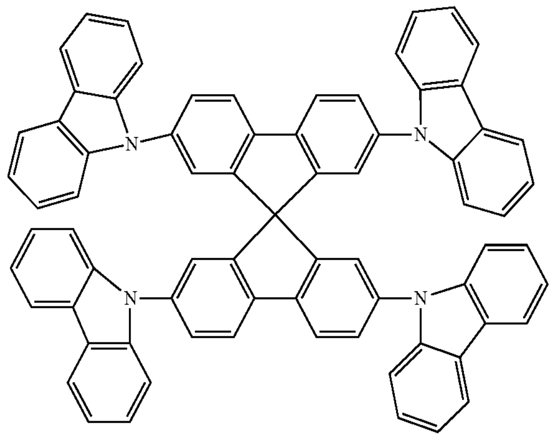
In the production of the organic electroluminescent device, the compound represented by the general formula (1) may be used not only in one layer of an organic layer (for example, an electron transporting layer), but also in plural organic layers. In this case, the compounds represented by the general formula (1) used in the organic layers may be the same as or different from each other. For example, the compound represented by the general formula (1) may be used in the injection layer, the barrier layer, the hole barrier layer, the electron barrier layer, the exciton barrier layer, the hole transporting layer, and the like, in addition to the electron transporting layer and the light-emitting layer. The film forming methods of the layers are not particularly limited, and the layers may be produced by any of a dry process and a wet process.

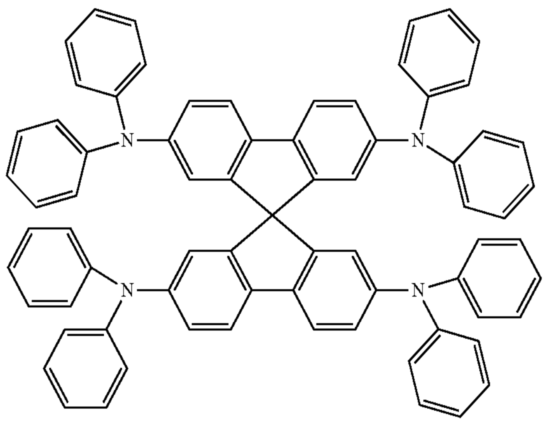
Specific examples of the preferred materials that may be used in the organic electroluminescent device are shown below, but the materials that may be used in the invention are not construed as being limited to the example compounds below. The compound that is shown as a material having a particular function may also be used as a material having another function. In the following structural formulae of the example compounds, R, R', and R_1 to R_{10} each independently represent a hydrogen atom or a substituent, X represents a carbon atom or a hetero atom forming a ring skeleton, n represents an integer of from 3 to 5, Y represents a substituent, and m represents an integer of 0 or more.

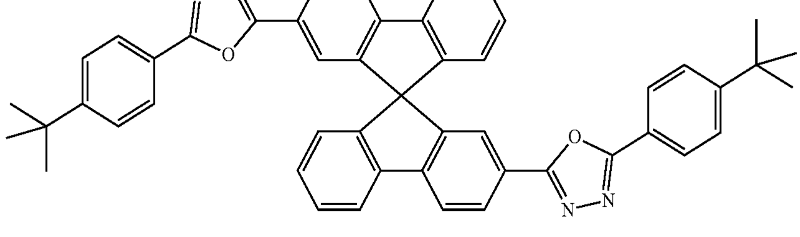
Preferred examples of a compound that may also be used as the host material of the light-emitting layer are shown below.











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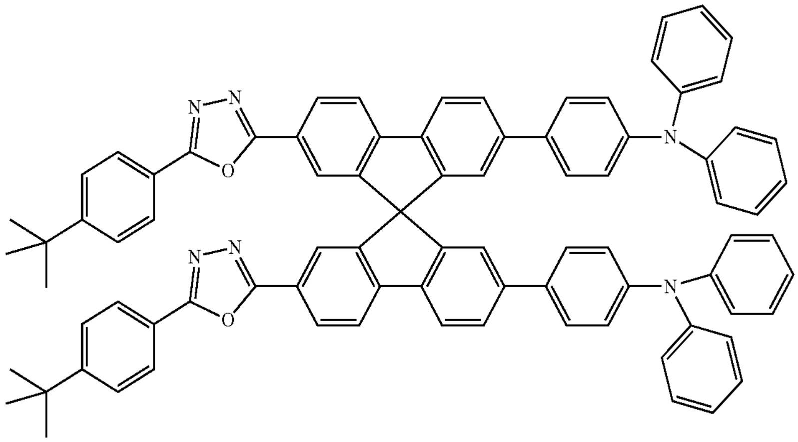

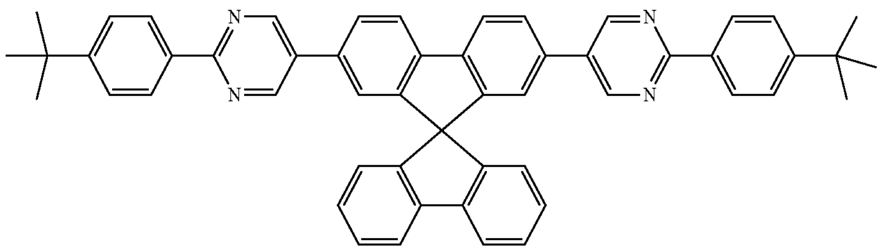

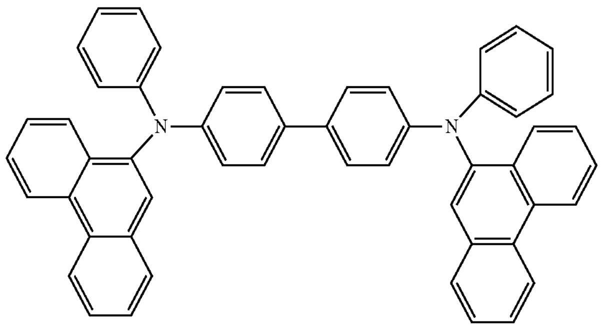

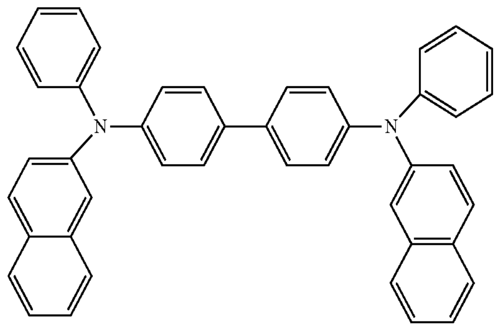

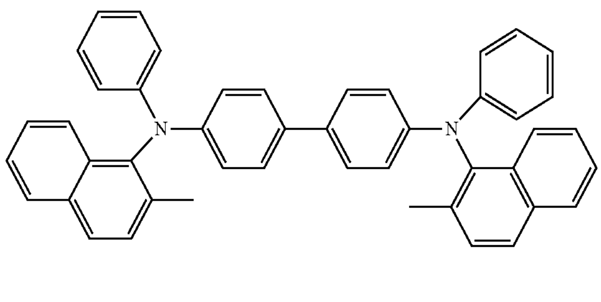

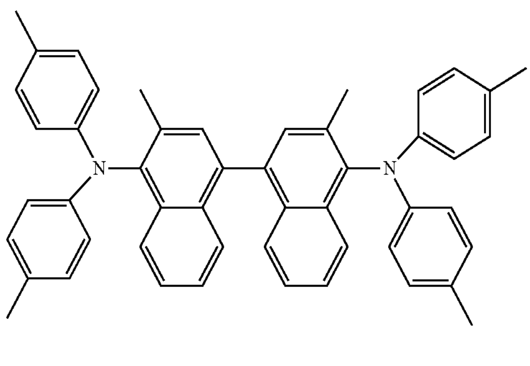

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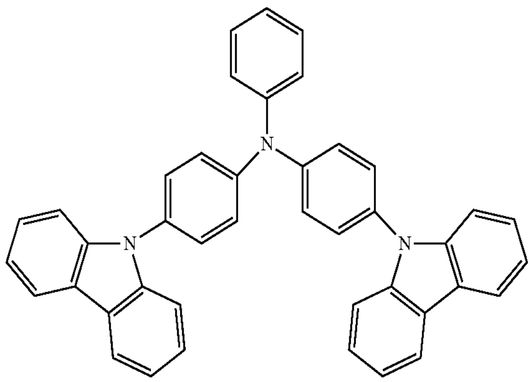

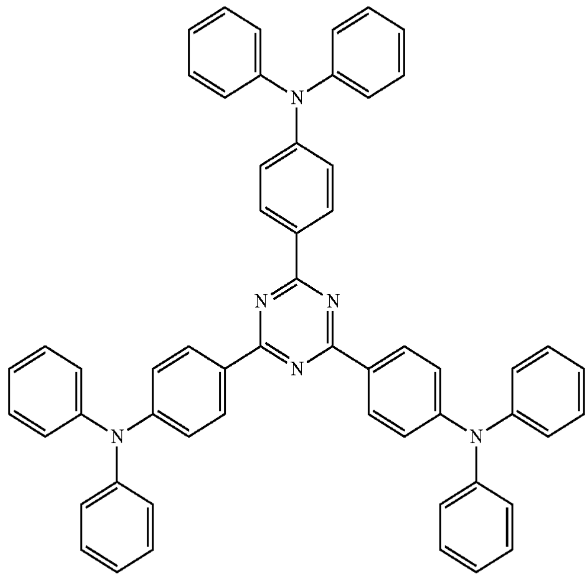

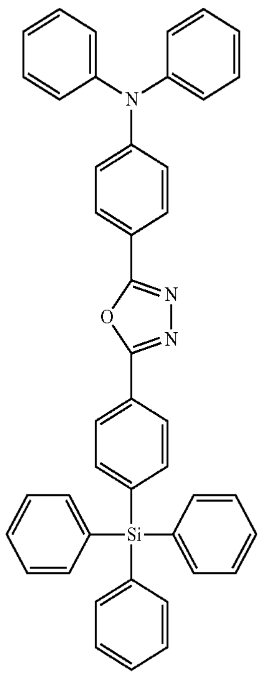

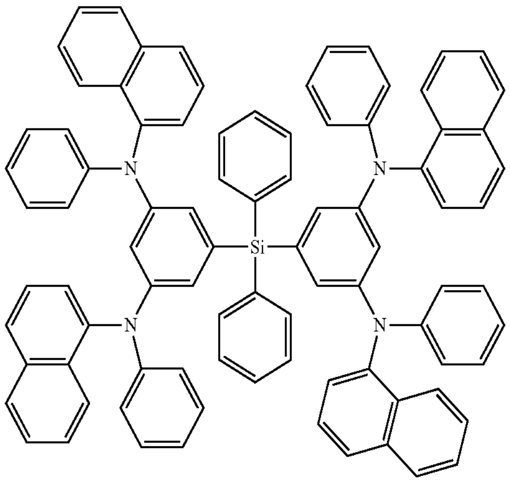

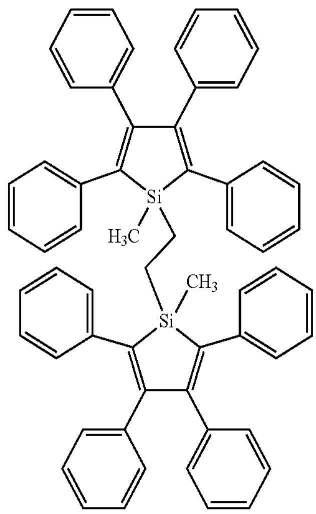

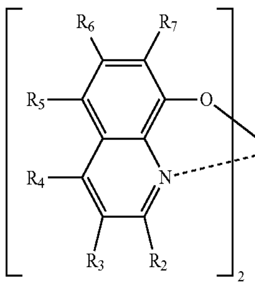

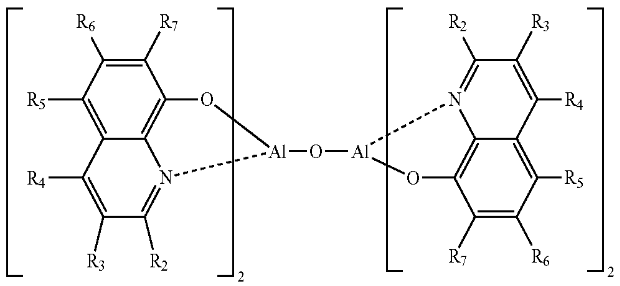

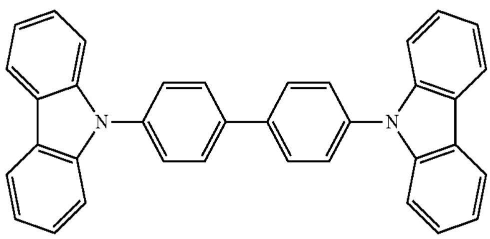

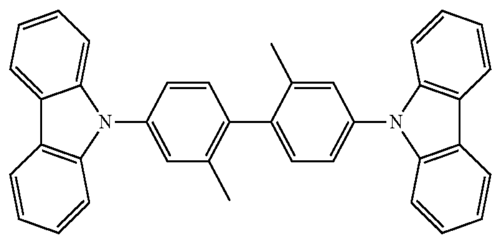

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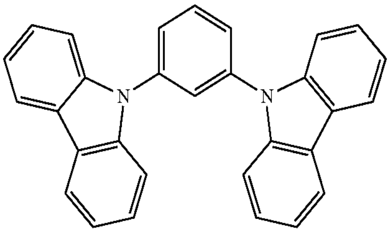

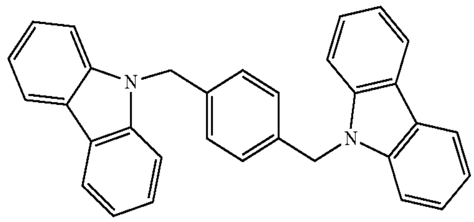

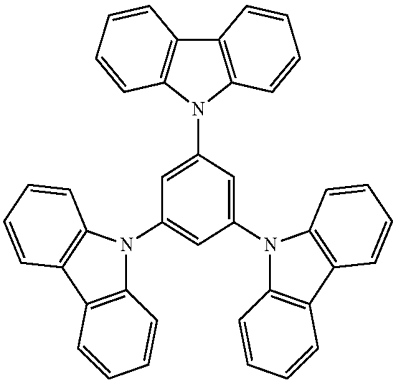

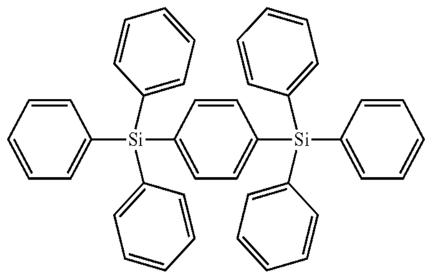

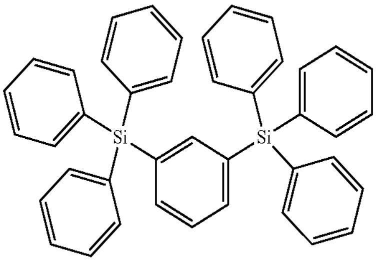

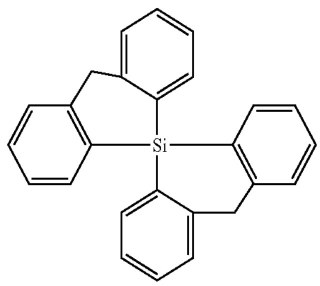

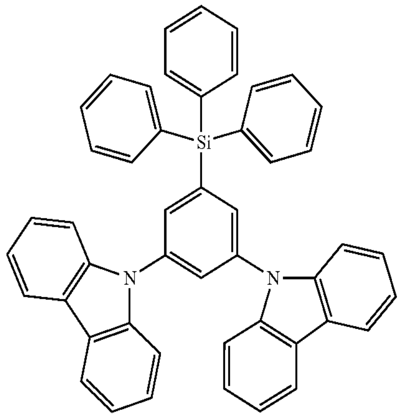

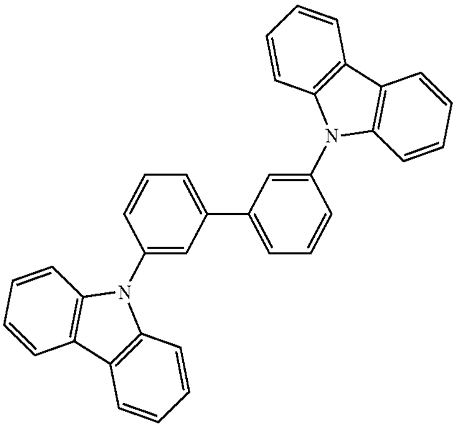

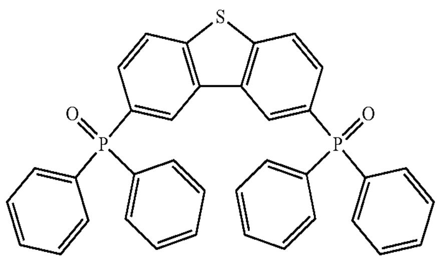

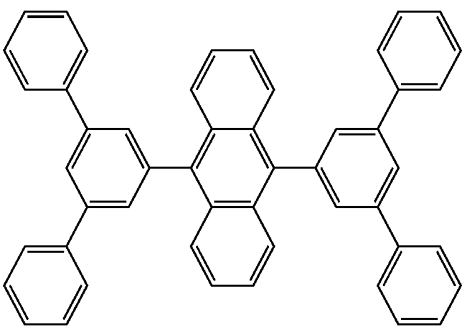

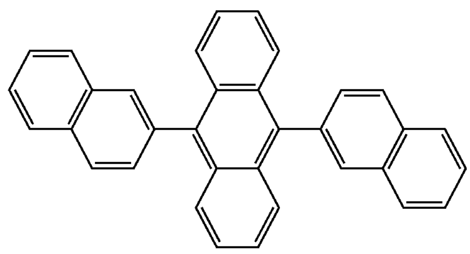

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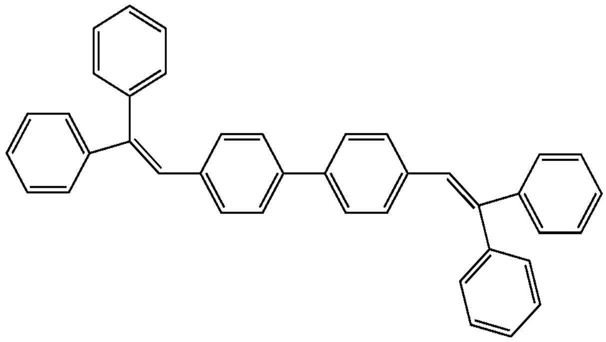

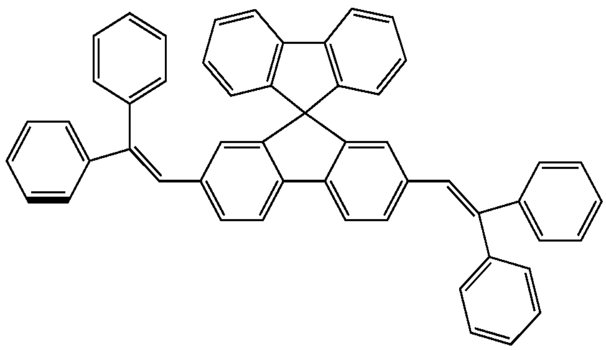

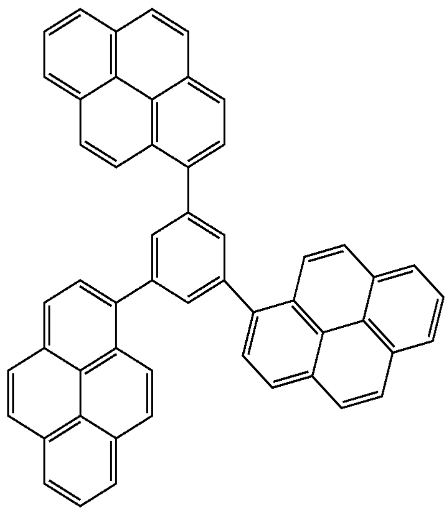

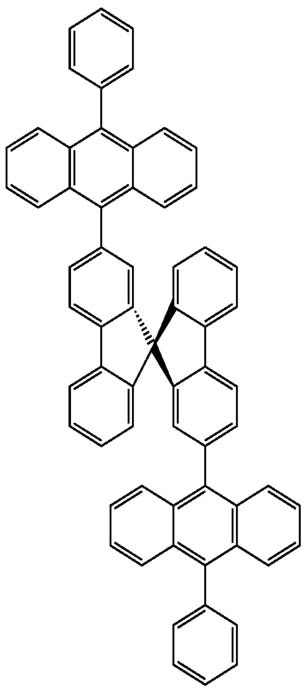

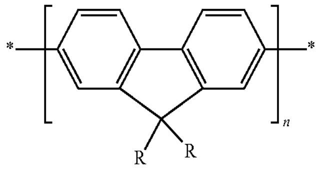

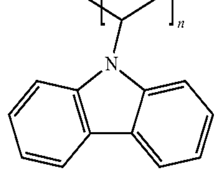

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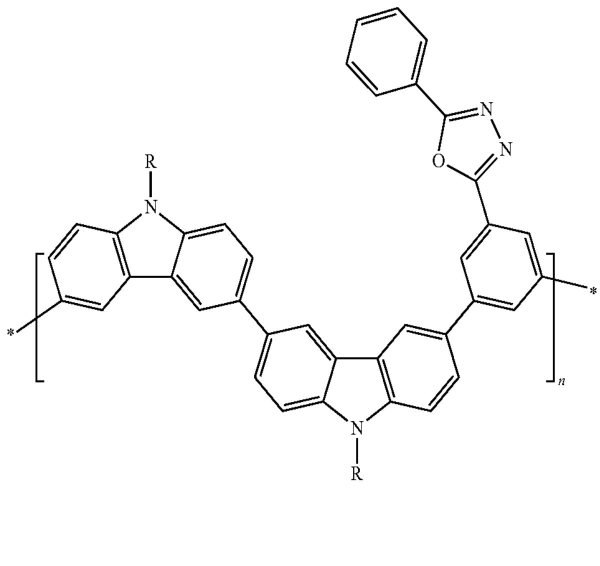
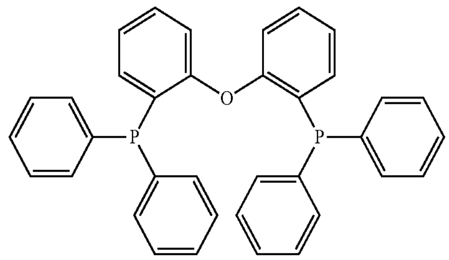
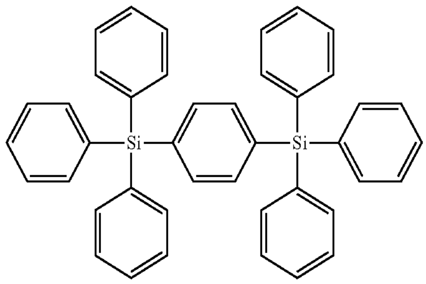
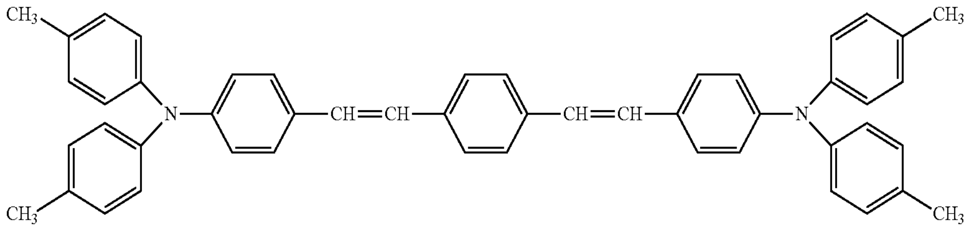
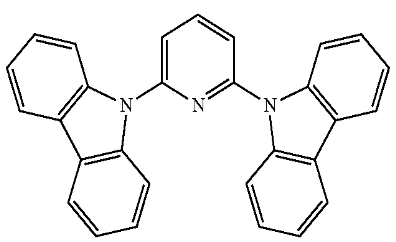


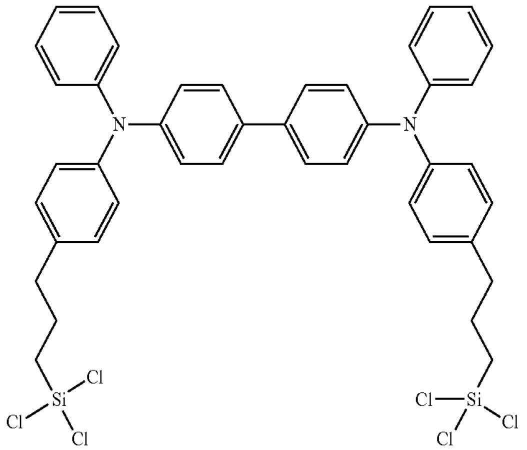


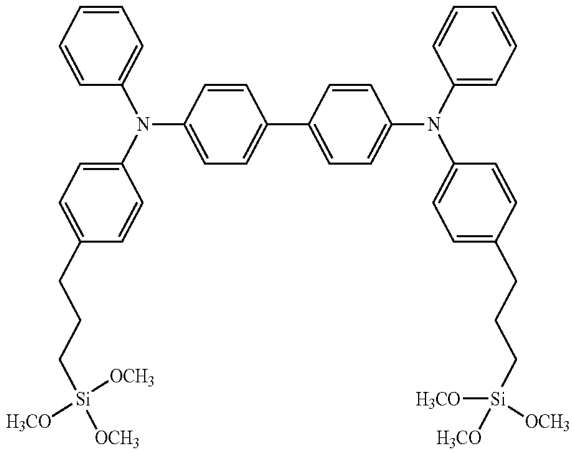


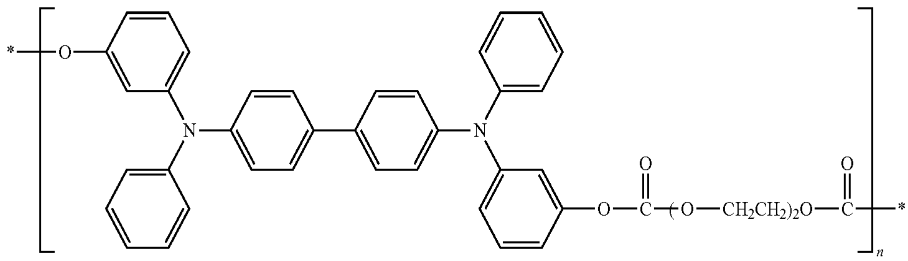


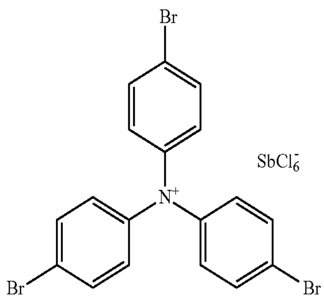


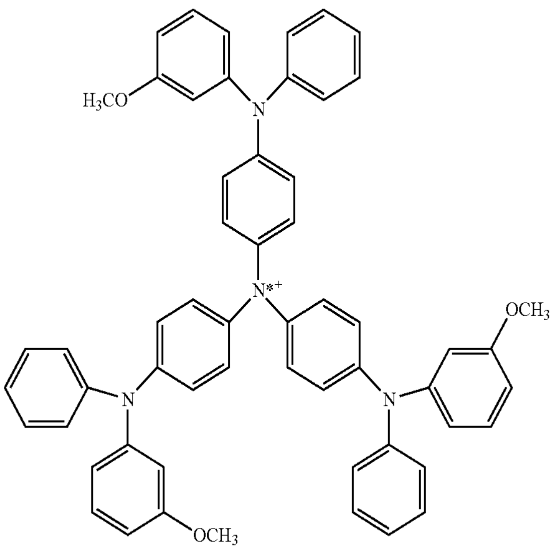
Preferred examples of a compound that may be used as the hole injection material are shown below.

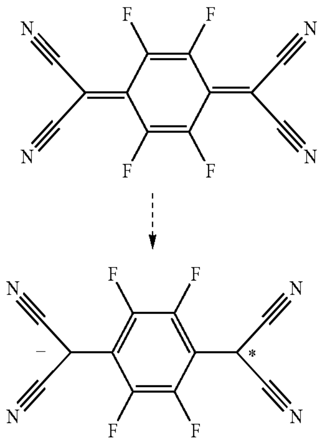


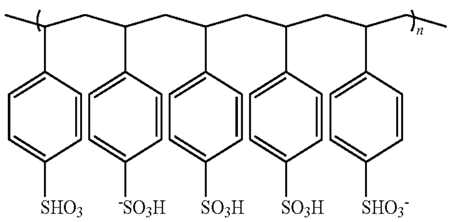












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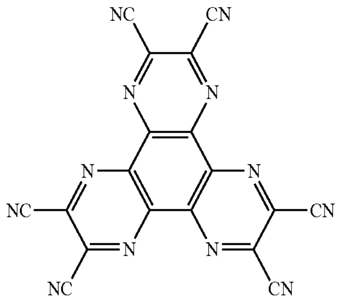
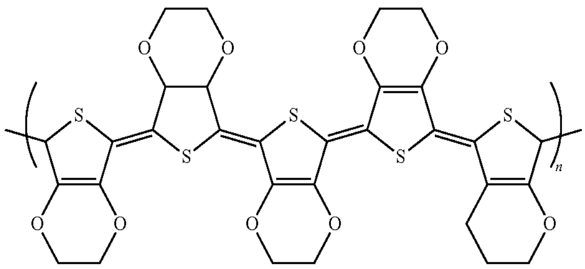
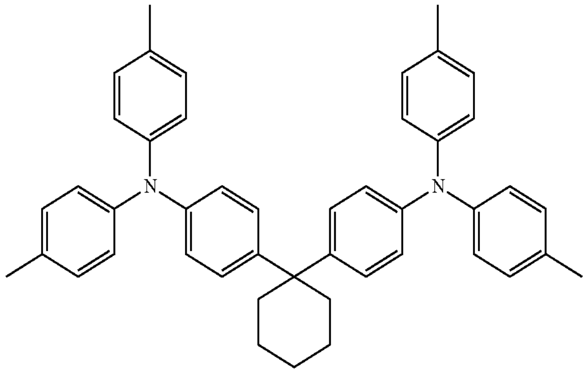
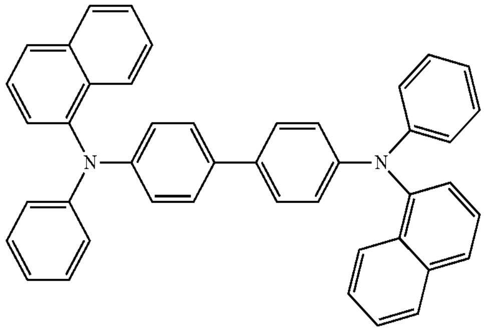
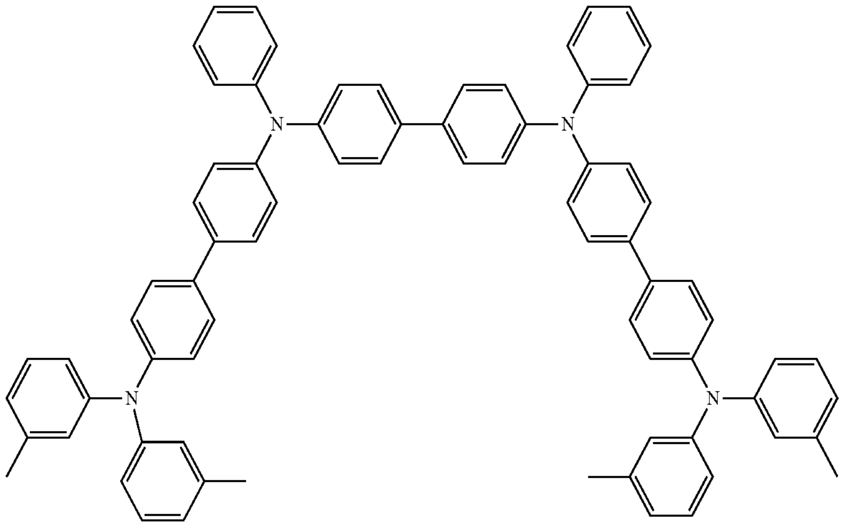


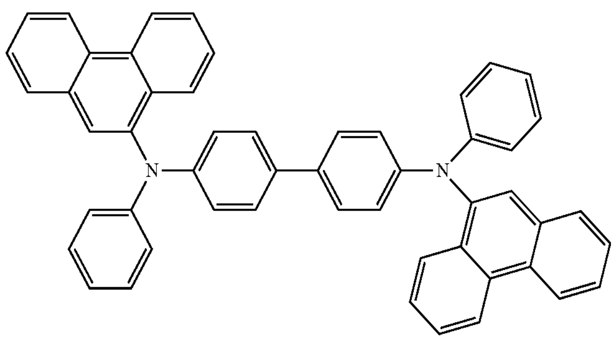


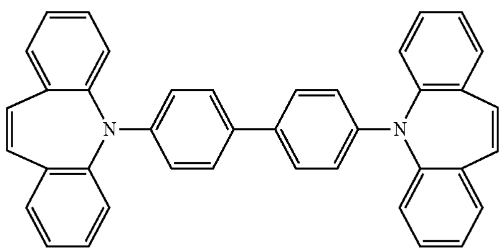
Preferred examples of a compound that may be used as the hole transporting material are shown below.











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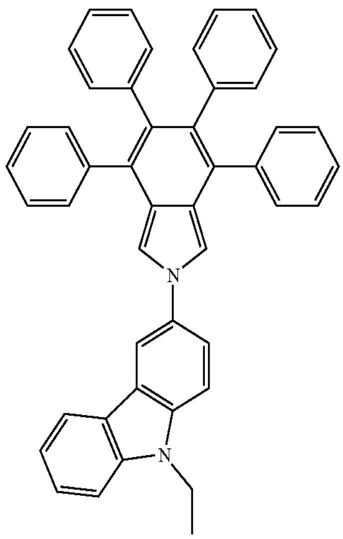

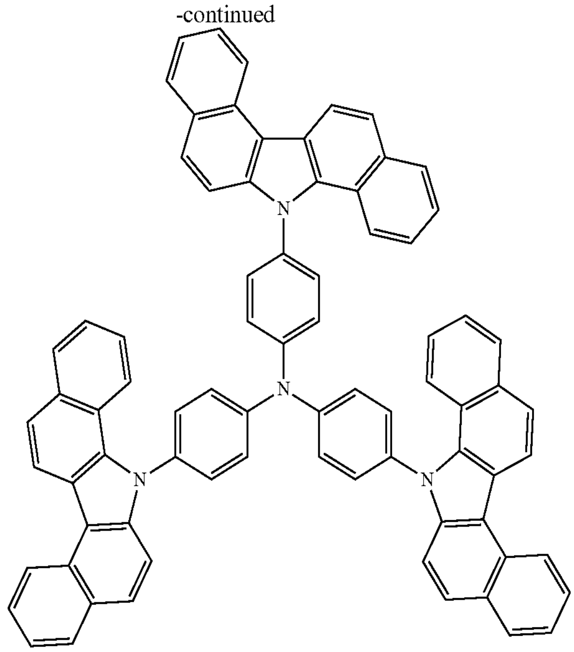

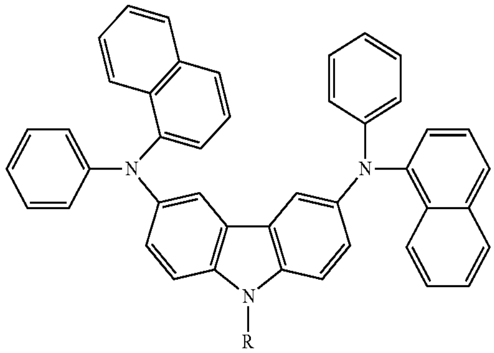

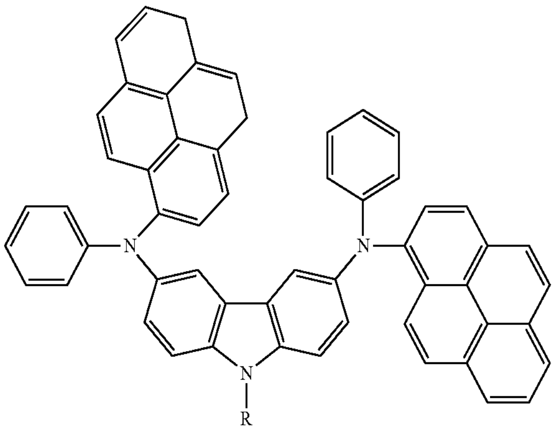

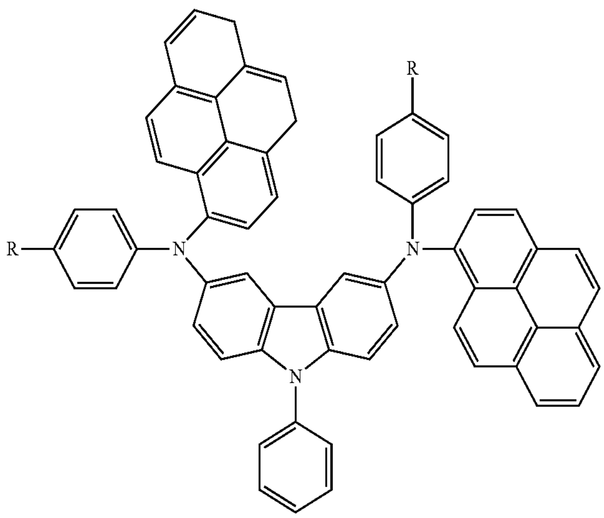

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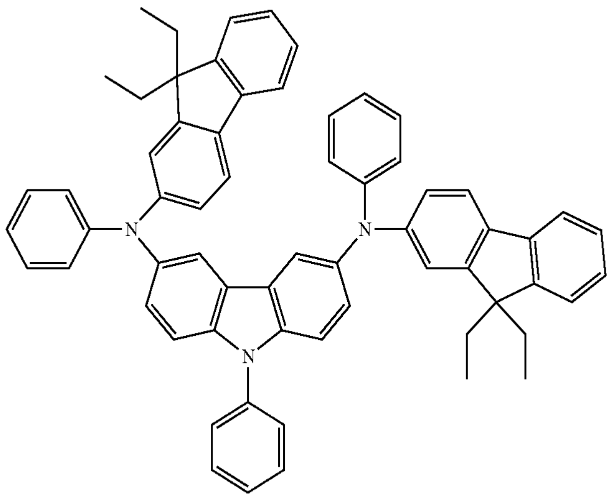

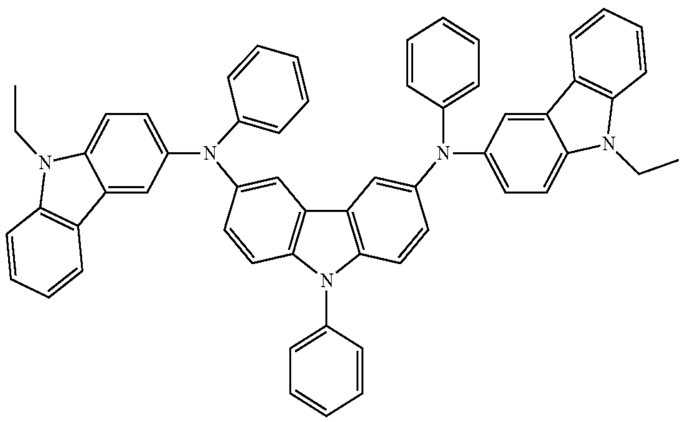

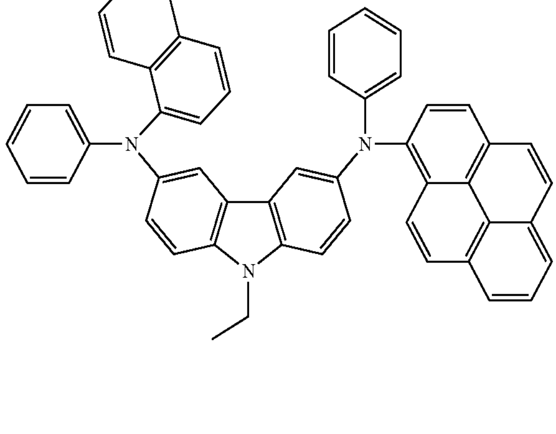

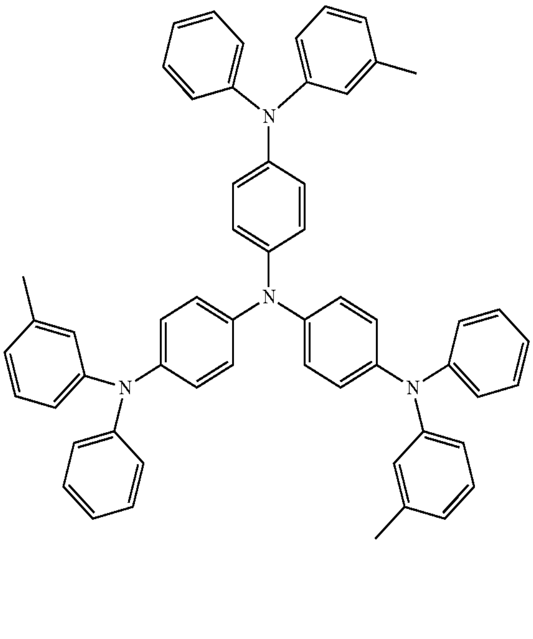

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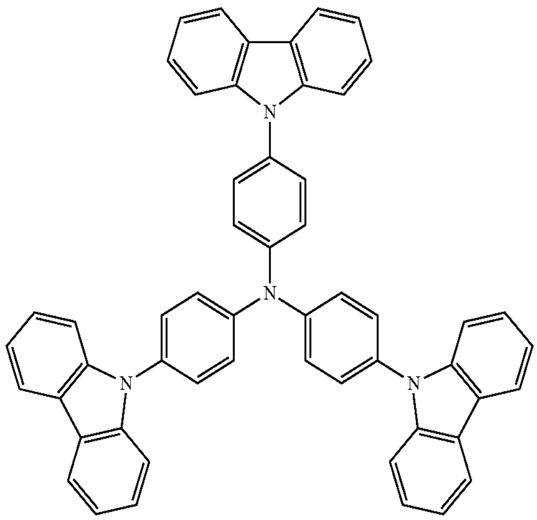

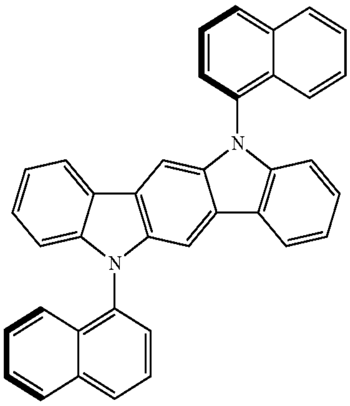

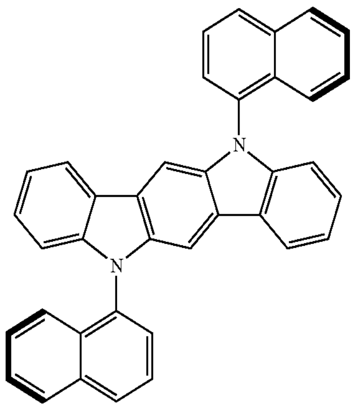

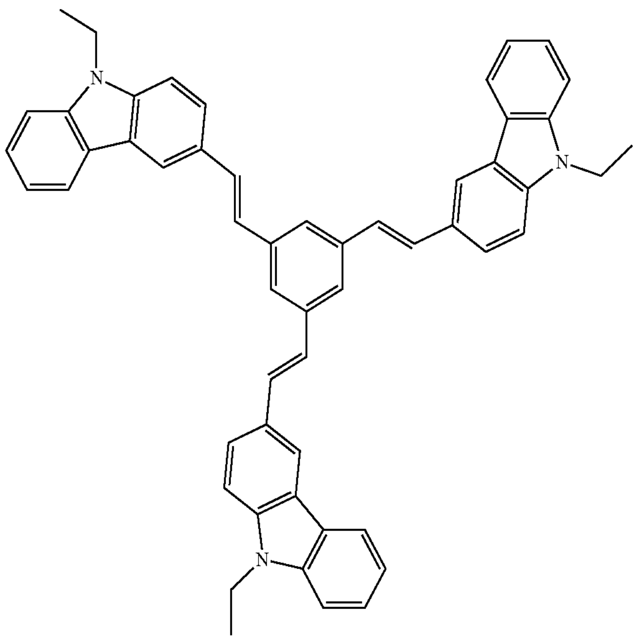

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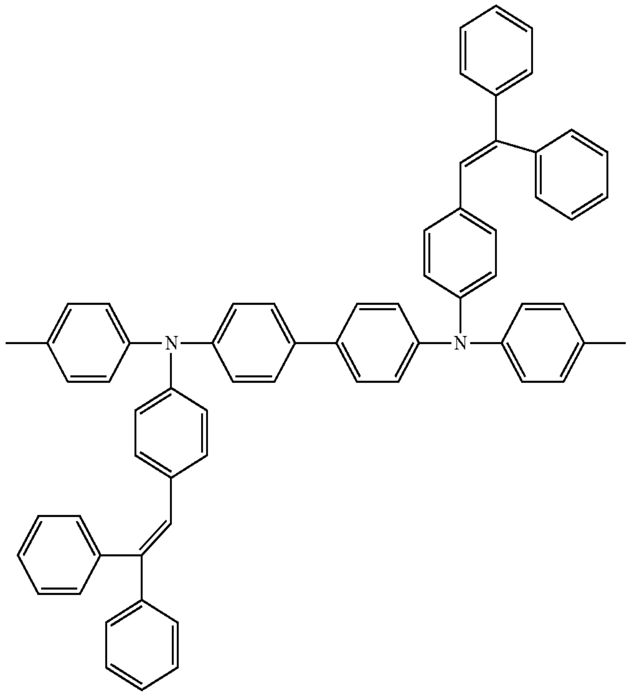

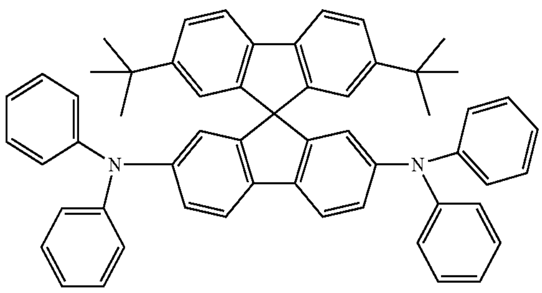

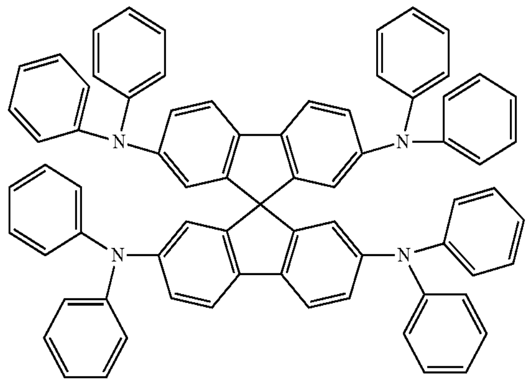

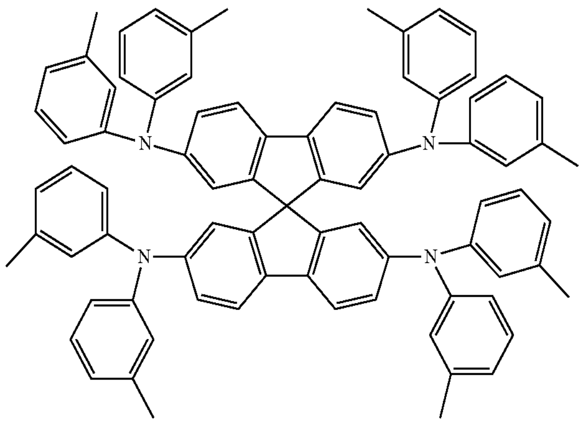

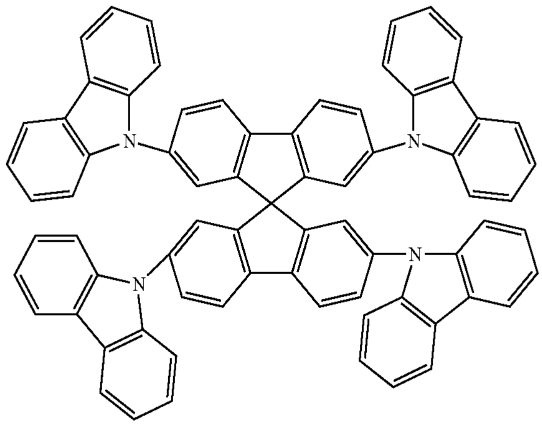

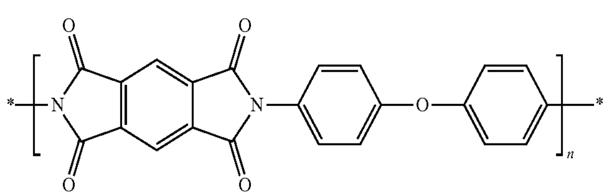

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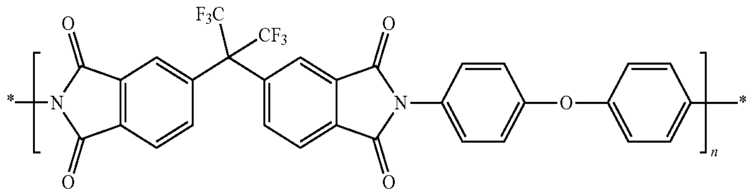
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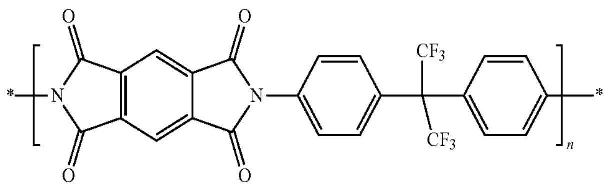
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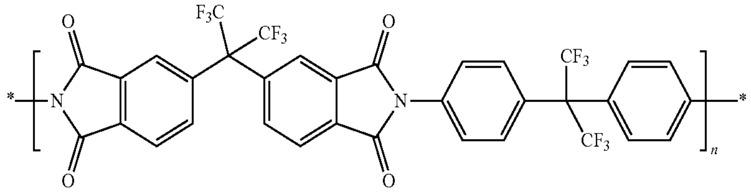
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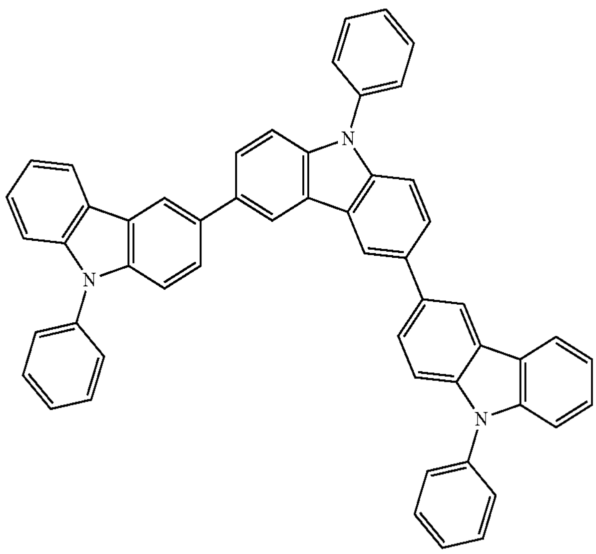
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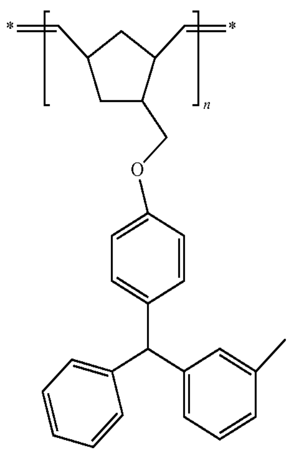
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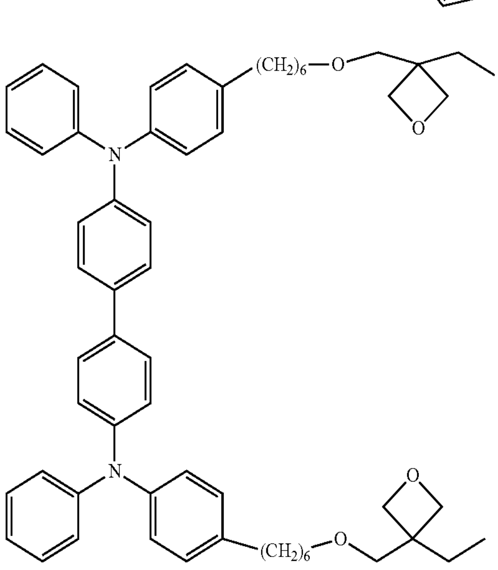
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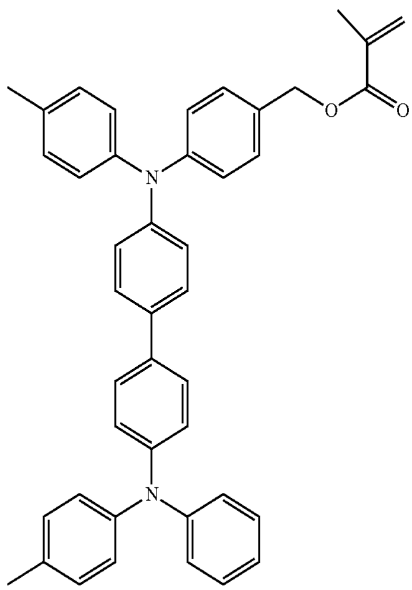
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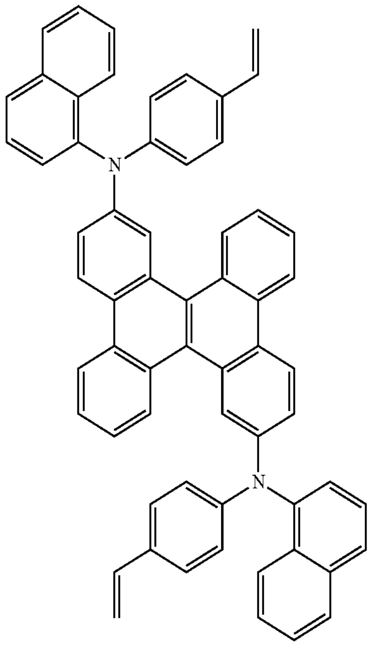
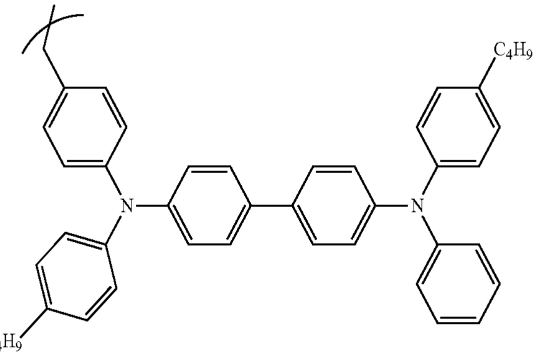
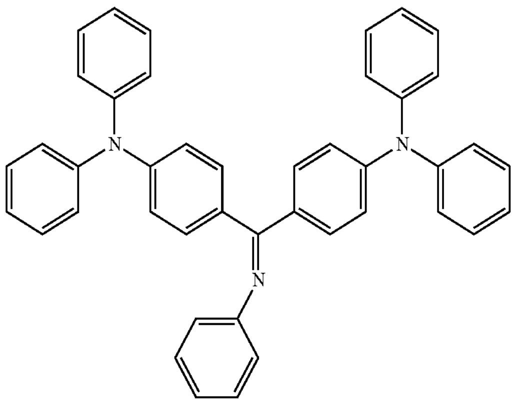
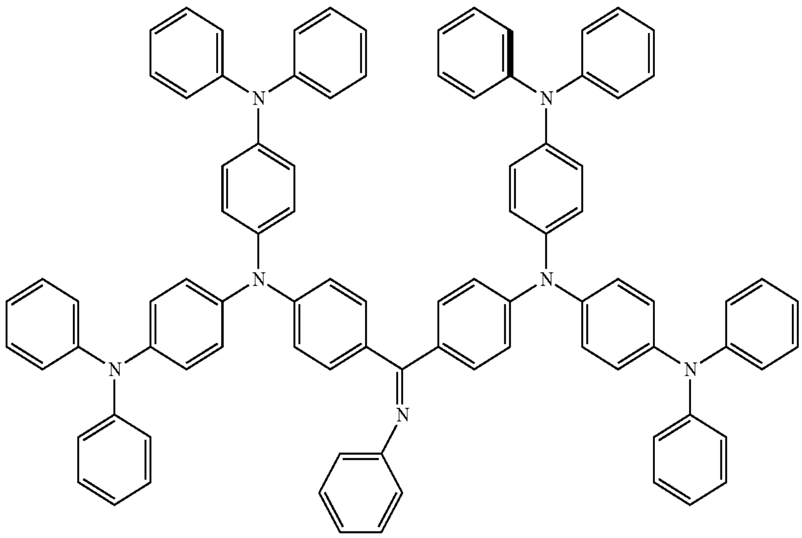


R = 





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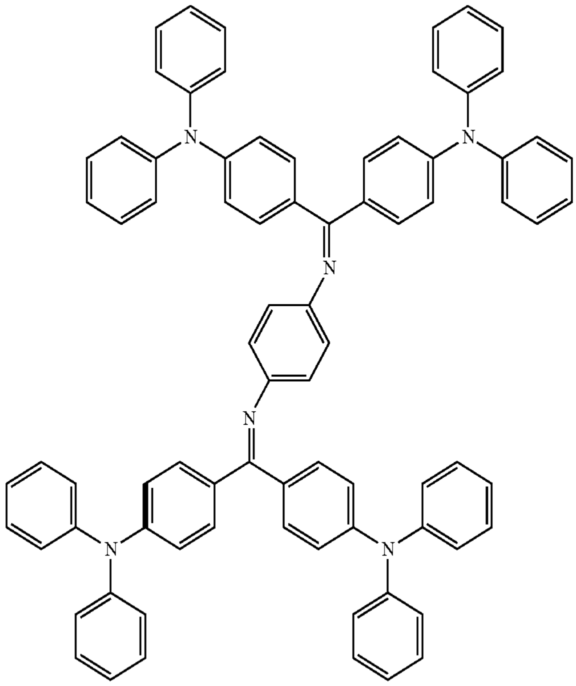

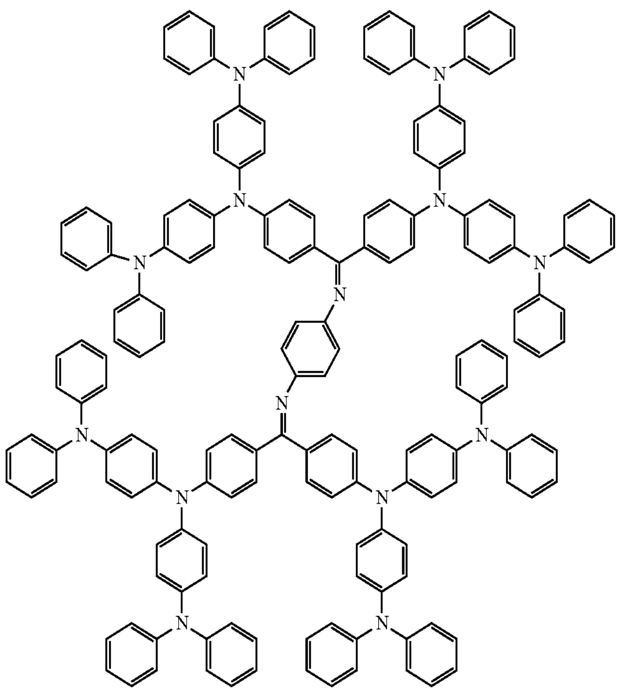

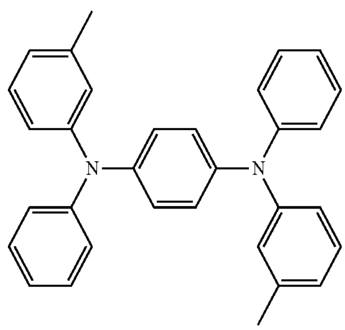

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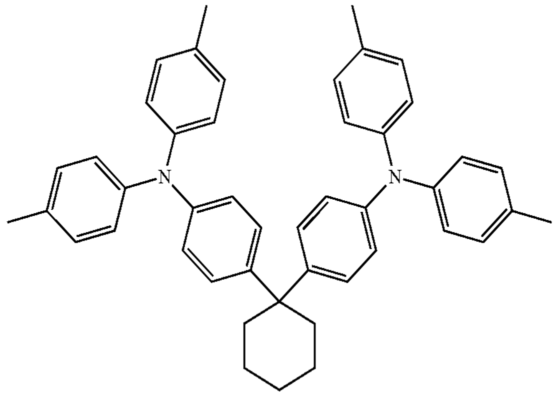

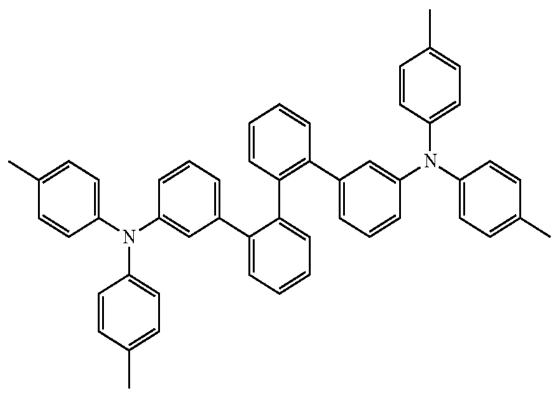

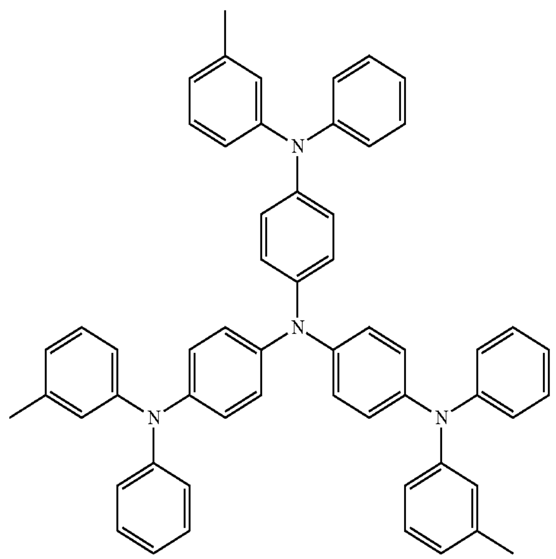

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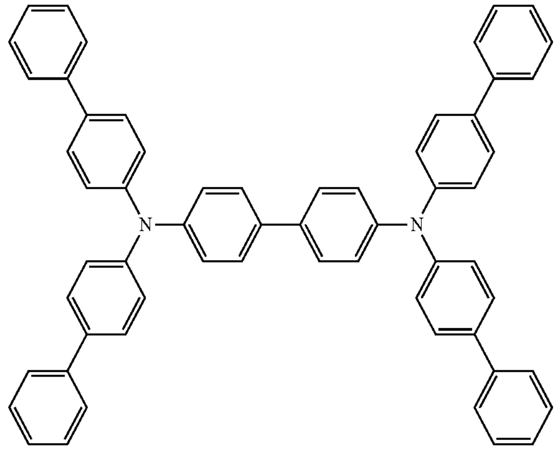

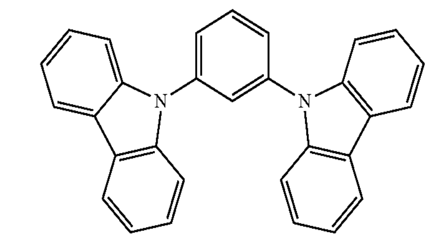

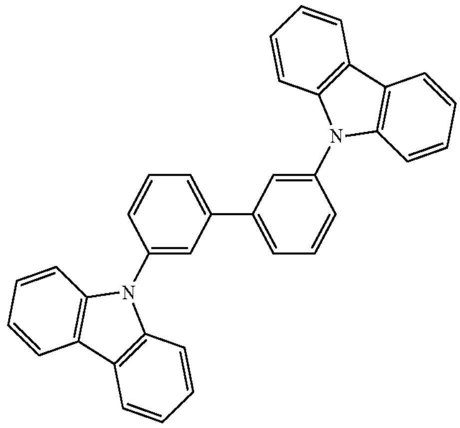

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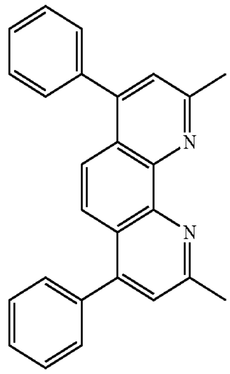

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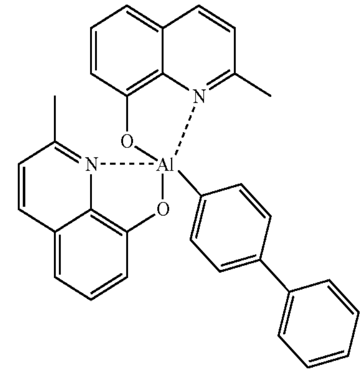

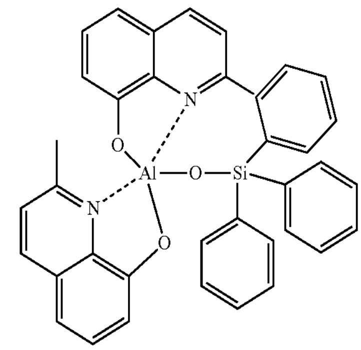

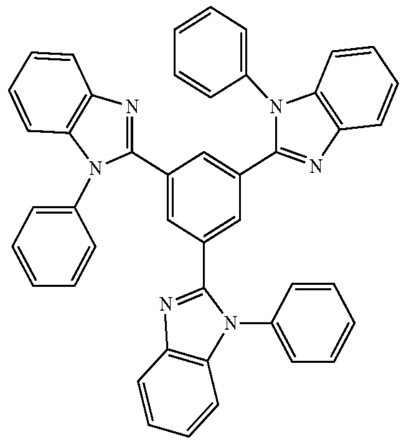

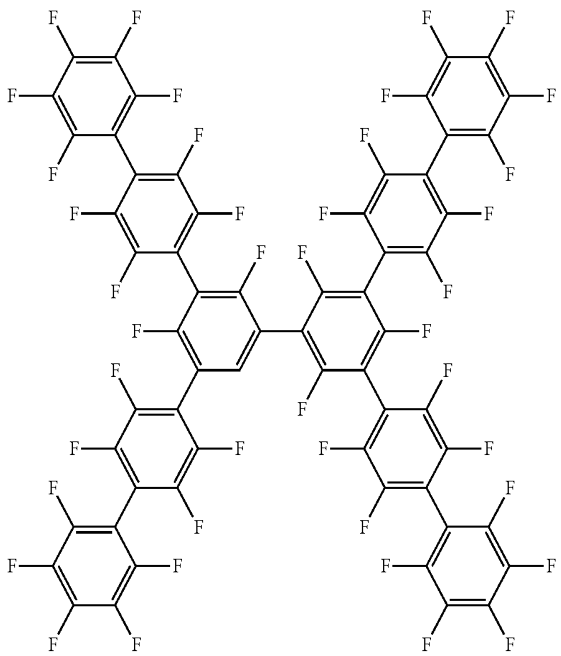

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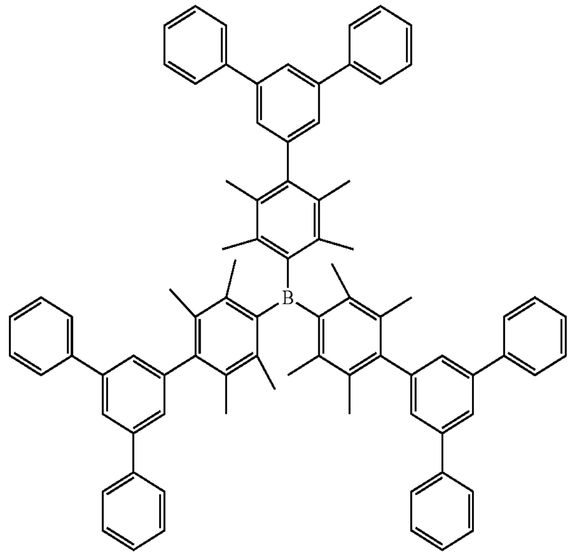

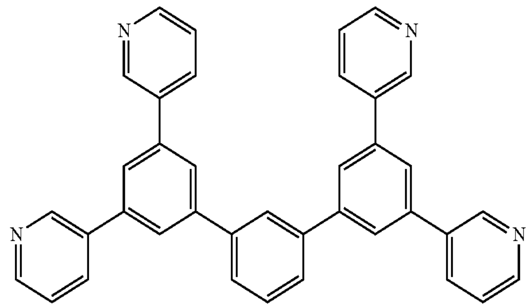

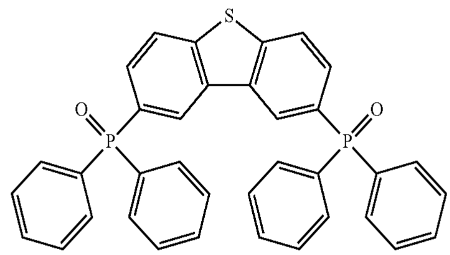

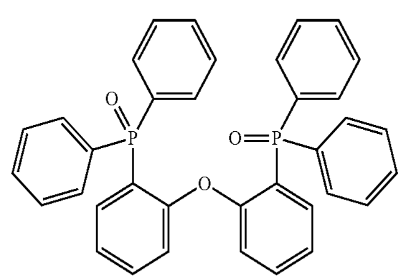

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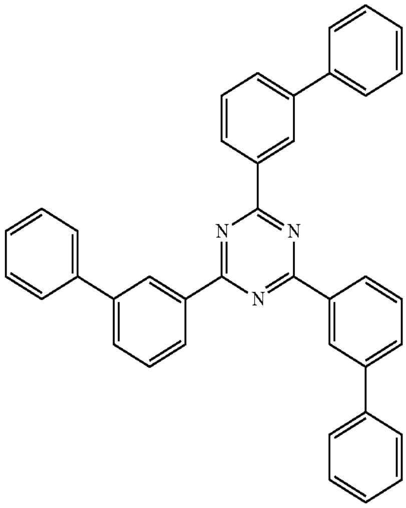

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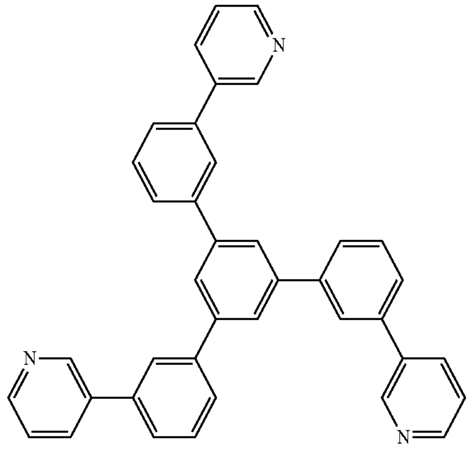

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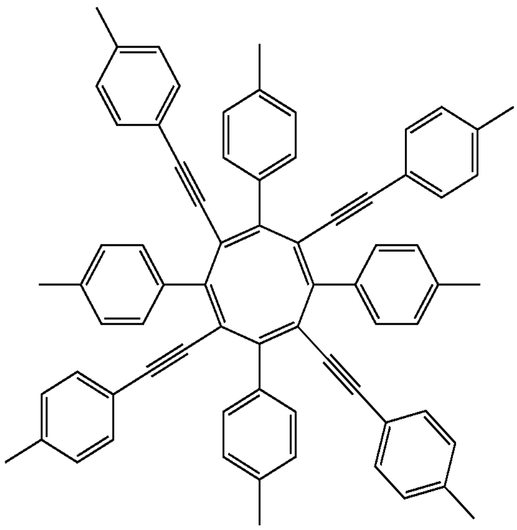

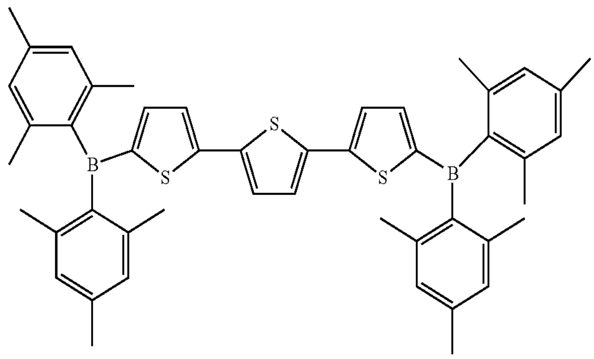

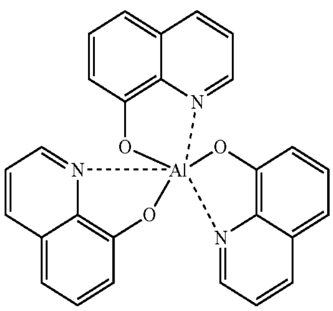

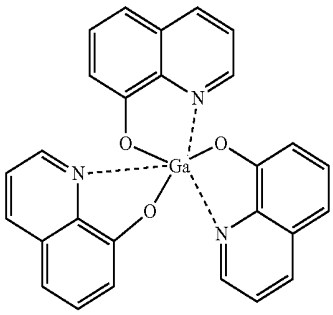

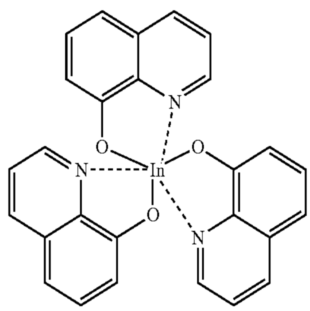

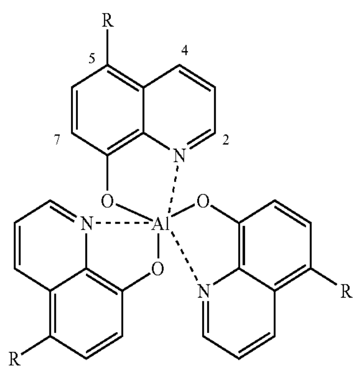

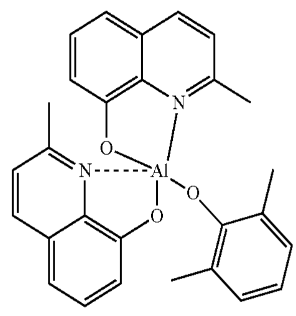

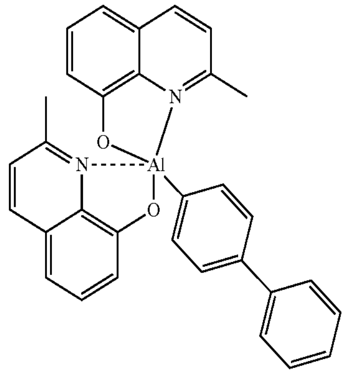

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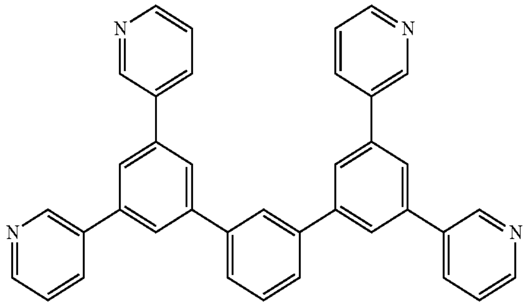

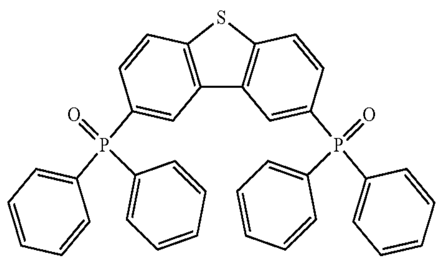

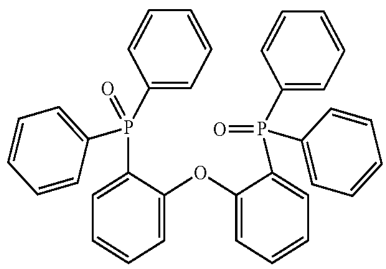

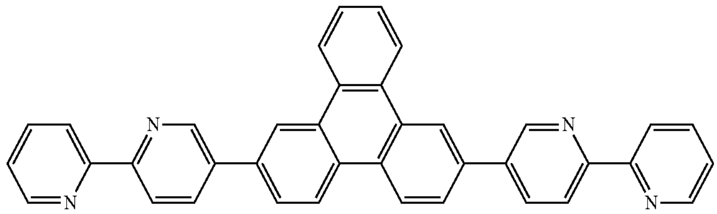

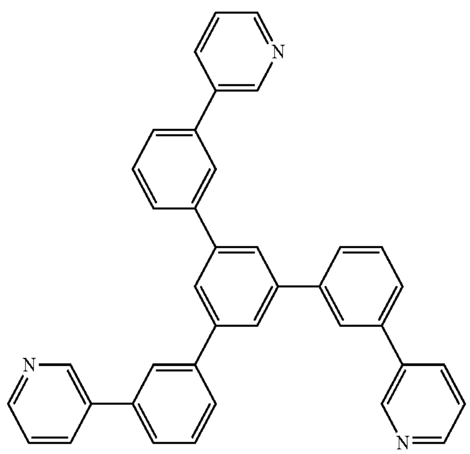

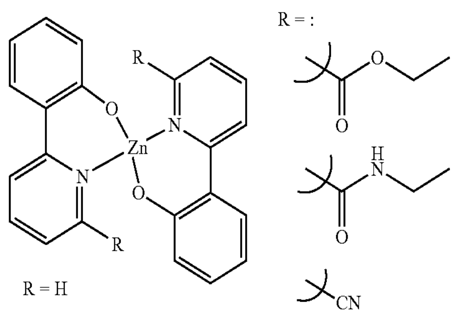

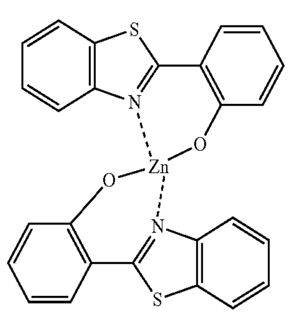

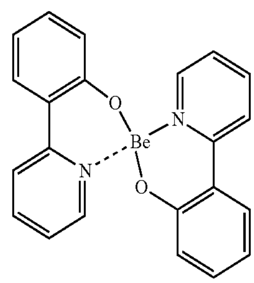

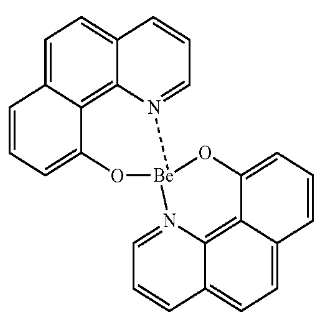

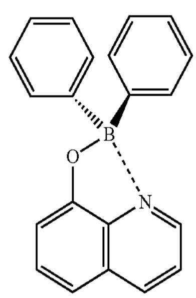

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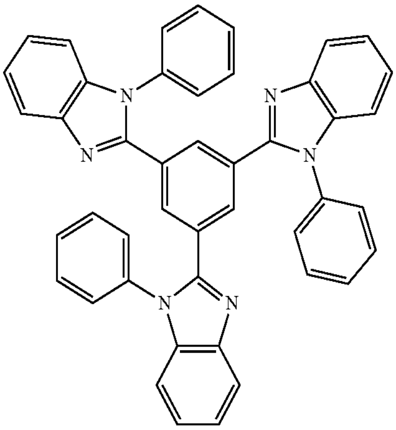

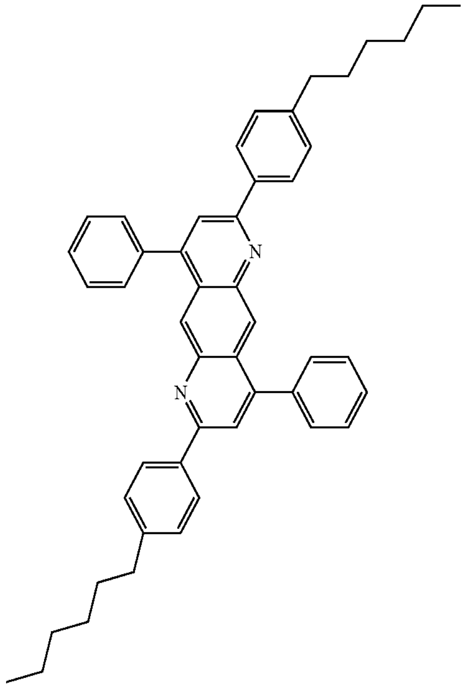

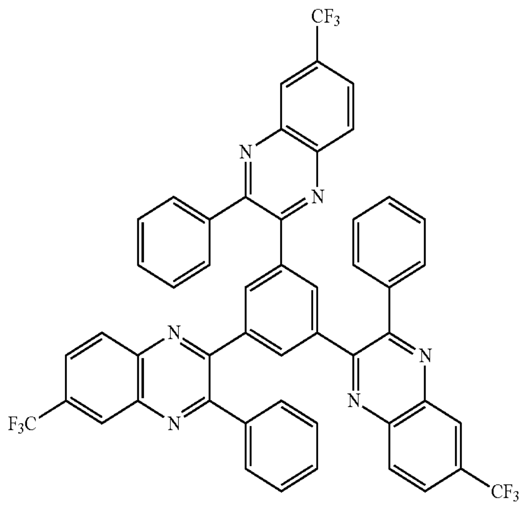

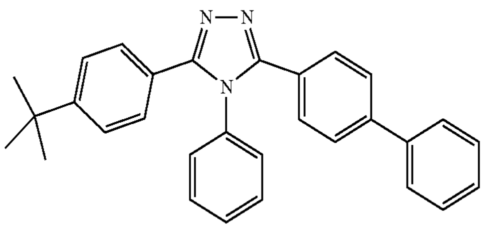

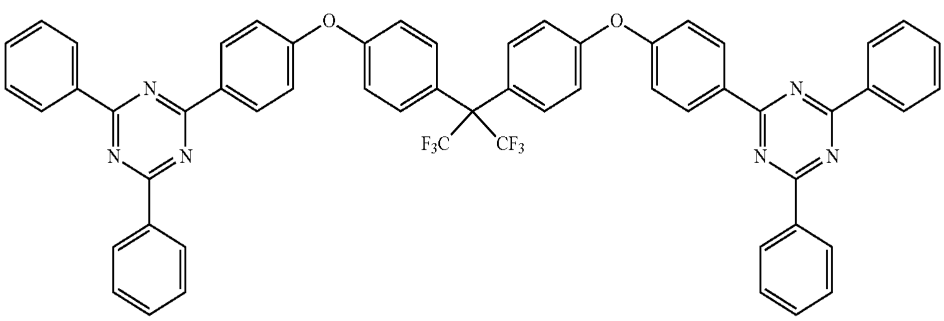

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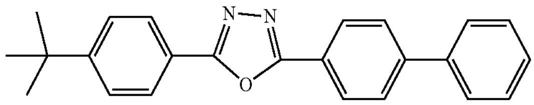
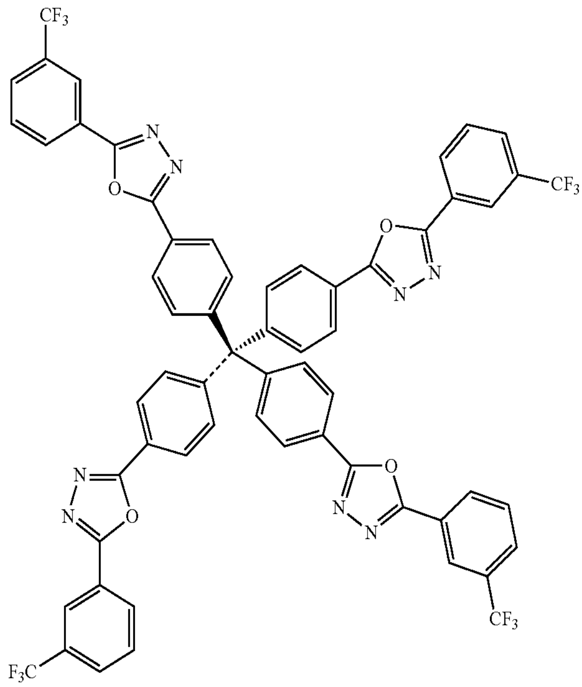
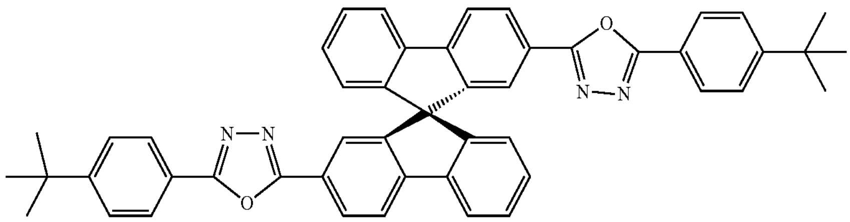
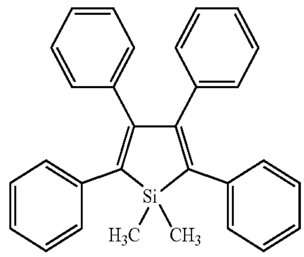
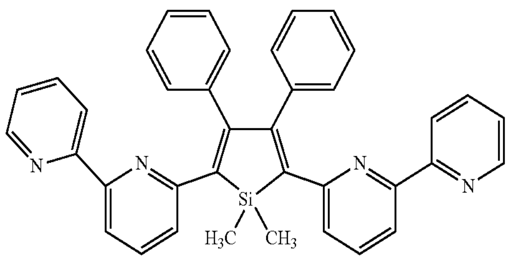
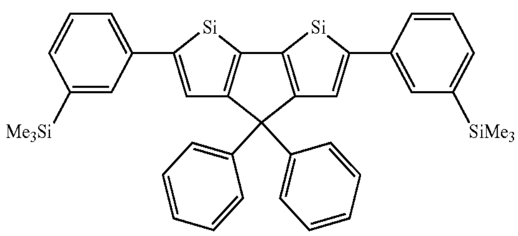


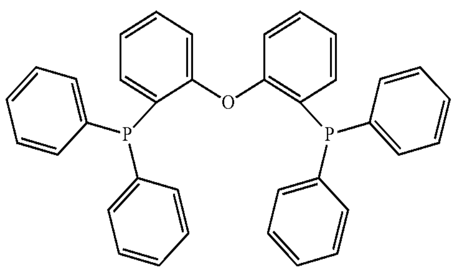


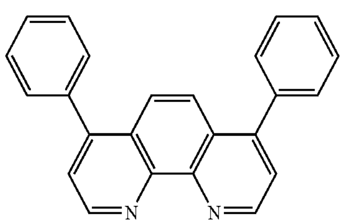






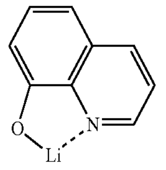


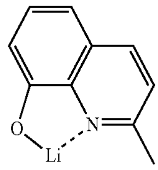


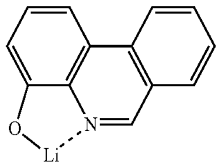


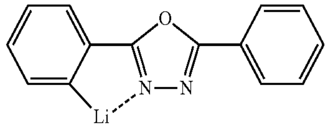
Preferred examples of a compound that may be used as the electron injection material are shown below.

LiF

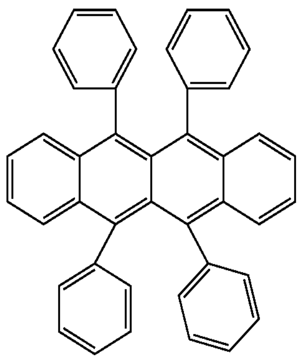


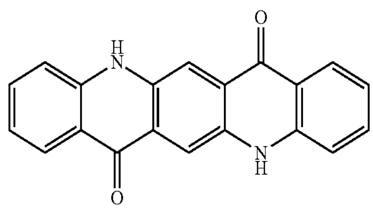


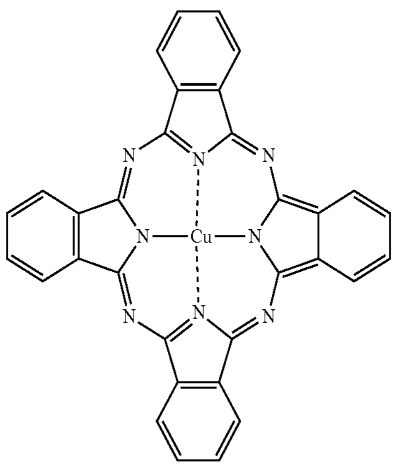




Preferred examples of a compound as a material that may be added are shown below. For example, the compound may be added as a stabilizing material.







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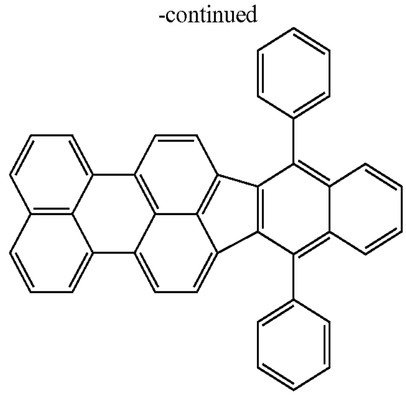
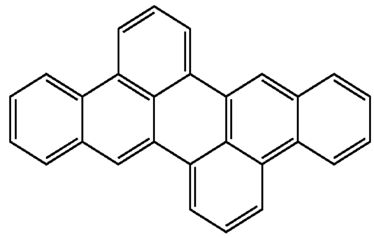




The organic electroluminescent device thus produced by the aforementioned method emits light on application of an electric field between the anode and the cathode of the device. In this case, when the light emission is caused by the excited singlet energy, light having a wavelength that corresponds to the energy level thereof may be confirmed as fluorescent light and delayed fluorescent light. When the light emission is caused by the excited triplet energy, light having a wavelength that corresponds to the energy level thereof may be confirmed as phosphorescent light. The normal fluorescent light has a shorter light emission lifetime than the delayed fluorescent light, and thus the light emission lifetimes may be distinguished between the fluorescent light and the delayed fluorescent light.

The phosphorescent light may substantially not be observed with a normal organic compound, such as the compound of the invention, at room temperature since the excited triplet energy is unstable, and is immediately deactivated due to the large kinetic constant of thermal deactivation and the small kinetic constant of light emission. The excited triplet energy of the normal organic compound may be measured by observing light emission under an extremely low temperature condition.

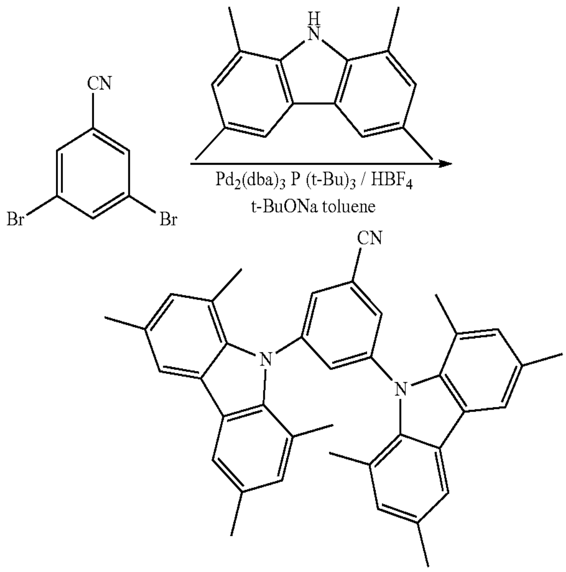
The organic electroluminescent device of the invention may be applied to any of a single device, a structure with plural devices disposed in an array, and a structure having anodes and cathodes disposed in an X-Y matrix. According to the invention, an organic light-emitting device that is largely improved in light emission efficiency may be obtained by adding the compound represented by the general formula (1) in the light-emitting layer. The organic light-emitting device, such as the organic electroluminescent device, of the invention may be applied to a further wide range of purposes. For example, an organic electroluminescent display apparatus may be produced with the organic electroluminescent device of the invention, and for the details thereof, reference may be made to S. Tokito, C. Adachi and H. Murata, "Yuki EL Display" (Organic EL Display) (Ohmsha, Ltd.). In particular, the organic electroluminescent device of the invention may be applied to organic electroluminescent illumination and backlight which are highly demanded.

EXAMPLES

The features of the invention will be described more specifically with reference to synthesis examples and working examples below. The materials, processes, procedures, and the like shown below may be appropriately modified unless they deviate from the substance of the invention. Accordingly, the scope of the invention is not construed as being limited to the specific examples shown below. The ultraviolet ray absorption spectrum was measured with LAMBDA 950-PKA (produced by Perkin-Elmer Corporation), the light emission spectrum was measured with Fluoromax-4 (produced by Horiba Jobin Yvon SAS), and the transient decay curve was measured with Quantaurus-tau (produced by Hlamamatsu Photonics K.K.). In the working examples, fluorescent light that had a light emission lifetime of 0.05 μs or more was determined as delayed fluorescent light.

Synthesis Example 1

Synthesis of Compound 291



Compound 291

1,3,6,8-tetramethyl-9H-carbazole (1.07 g, 4.80 mmol), 3,5-dibromobenzonitrile (0.522 g, 2.00 mmol), sodium tert-butoxide (0.768 g, 8.00 mmol), tris (dibenzylideneacetone) dipalladium (O) (92.8 mg, 0.101 mmol) and tetrafluoroborate tri-tert-butylphosphine (0.220 g, 0.758 mmol) were added to a 100 mL three-neck flask having been substituted with nitrogen. The mixture was added with 35 mL of dehydrated toluene and stirred under heating at 95° C. for 12 hours. After the mixture was returned to room temperature, the mixture was added with chloroform and stirred. Then, the solution was rinsed with saturated saline. After the rinsing, the solution was added with anhydrous magnesium sulfate and dried. After the drying, the mixture was subjected to suction filtration for concentration, so that filtrate was obtained. The obtained filtrate was purified by silica gel column chromatography with hexane:chloroform (=2:1) as a developing solvent. The white solid matter obtained by concentrating the obtained fraction was stirred under heating by hexane and then filtered. The solid matter recovered by filtration was recrystallized with toluene, so that the white crystals of the target material were obtained in a yield amount of 470 mg and a yield of 45.0%.

^{1}H-NMR (500 MHz, $CDCl_3$, δ): 8.07 (d, J=2.0 Hz, 2H), 7.63 (s, 4H), 7.07 (t, J=2.0 Hz, 1H), 6.88 (s, 4H), 2.42 (s, 12H), 1.98 (s, 12H)

ASAP mass spectrum analysis:

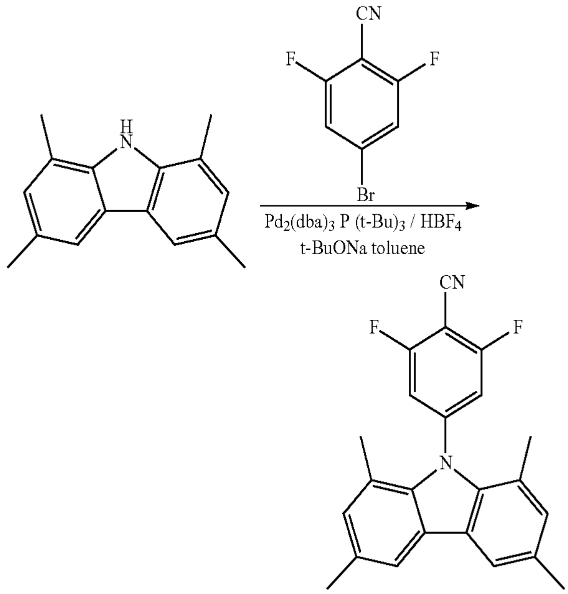
Theoretical value: 545.7

Observed value: 545.7

Synthesis Example 2

Synthesis of Compound 241

First, 2,6-difluoro-4-(1,3,6,8-tetramethyl-9H-carbazole-9-il)benzonitrile, which was an intermediate, was synthesized by the following reaction.



1,3,6,8-tetramethyl-9H-carbazole (1.20 g, 5.40 mmol), 4-bromo-2,6-difluorobenzonitrile (1.00 g, 4.59 mmol), sodium tert-butoxide (0.882 g, 9.18 mmol), tris(dibenzylideneacetone) dipalladium (O) (0.210 g, 0.230 mmol) and tetrafluoroborate tri-tert-butylphosphine (0.267 g, 0.920 mmol) were added to a 100 mL three-neck flask having been substituted with nitrogen. The mixture was added with 50 mL of dehydrated toluene and stirred under heating at 90° C. for 12 hours. After the stirring, the mixture was returned to the room temperature, added with chloroform and stirred. After the stirring, the mixture was rinsed with saturated saline. After the rinsing, the mixture was added with anhydrous magnesium sulfate and dried. Then, the mixture was subjected to suction filtration for concentration, so that filtrate was obtained. The obtained filtrate was purified by silica gel column chromatography with hexane:chloroform (=7:3) as a developing solvent. The obtained fraction was concentrated, so that white solid matter, which was 2,6-difluoro-4-(1,3,6,8-tetramethyl-9H-carbazole-9-il)benzonitrile, was obtained in a yield amount of 940 mg and a yield of 56.8%.

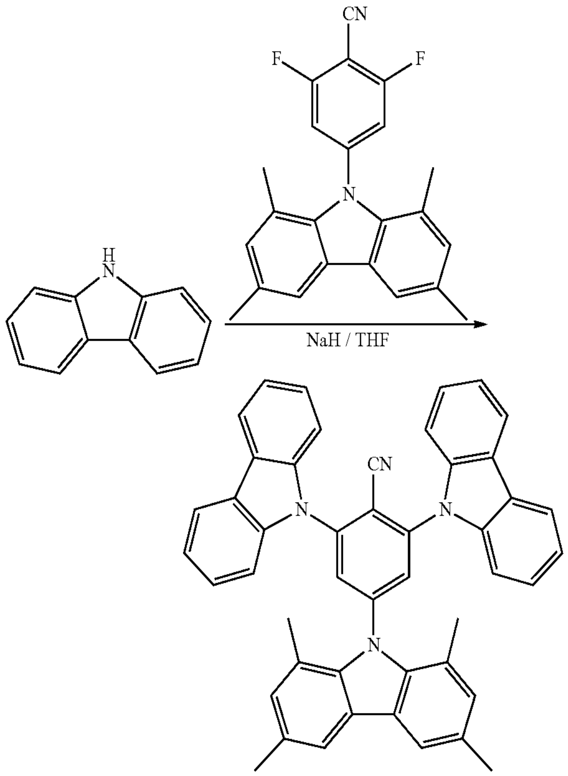
^{1}H-NMR (500 MHz, $CDCl_3$, δ): 7.71 (s, 2H), 7.18 (d, J=8.0 Hz, 2H), 6.94 (2, 2H), 2.47 (s, 6H), 1.96 (s, 6H)

ASAP mass spectrum analysis:

Theoretical value: 360.4

Observed value: 360.4

Subsequently, the compound 241 was synthesized by the following reaction.



Compound 241

Sodium hydride (0.42 g, 10.4 mmol), 9H-carbazole (1.30 g, 7.81 mmol) and 50 mL of dehydrated tetrahydrofuran were added to a 100 mL three-neck flask having been substituted with nitrogen, and followed by stirring at room temperature for 1 hour. After the stirring, the mixture was added with 2,6-difluoro-4-(1,3,6,8-tetramethyl-9H-carbazole-9-il)benzonitrile (0.930 g, 2.60 mmol) under a nitrogen stream, and was stirred at room temperature for 12 hours. After the stirring, the mixture was added with chloroform and stirred. Then, the solution was rinsed with saturated saline. After the rinsing, the solution was added with anhydrous magnesium sulfate and dried. After the drying, the mixture was subjected to suction filtration, so that filtrate was obtained. The solid matter obtained by concentrating the obtained filtrate was added to methanol, stirred under heating and subjected to suction filtration, so that the solid matter was recovered. The recovered solid matter was recrystallized with ethyl acetate, so that white solid matter of the target material was obtained in a yield amount of 1.20 g and a yield of 70.5%.

^{1}H-NMR (500 MHz, $CDCl_3$, δ): 8.15 (d, J=7.5 Hz, 4H), 7.87 (s, 2H), 7.69 (s, 2H), 7.51 (t, J=8.0 Hz, 4H), 7.37 (t, J=7.0 Hz, 4H), 7.31 (d, j=8.0 Hz, 4H), 6.99 (s, 2H), 2.46 (s, 6H), 2.29 (s, 6H)

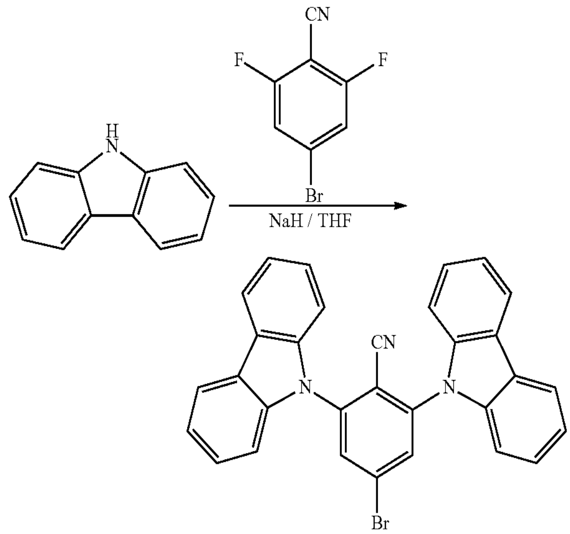
ASAP mass spectrum analysis:

Theoretical value: 654.8

Observed value: 654.8

Synthesis Example 3

First, 4-bromo-2,6-di(9H-carbazole-9-il)benzonitrile, which was an intermediate, was synthesized by the following reaction.



60% sodium hydride (0.275 g, 6.88 mmol), 40 mL of dehydrated tetrahydrofuran and 9H-carbazole (0.960 g, 5.73 mmol) were added to a 100 mL three-neck flask having been substituted with nitrogen, and followed by stirring at room temperature for 1 hour. While the mixture was cooled in an ice bath, the mixture was added with 4-bromo-2,6-difluorobenzonitrile (0.500 g, 2.29 mmol) under a nitrogen stream, and stirred for one night. After the stirring, the mixture was added with chloroform and water, stirred and rinsed with saturated saline. After the rinsing, the mixture was added with anhydrous magnesium sulfate and dried. Then, the mixture was subjected to suction filtration for concentration, so that solid matter was obtained. The obtained solid matter was purified by silica gel column chromatography with hexane:chloroform (=1:1) as a developing solvent. The obtained fraction was concentrated, so that the light yellow solid matter, which was 4-bromo-2,6-di(9H-carbazole-9-il)benzonitrile, was obtained in a yield amount of 310 mg and a yield of 26.5%.

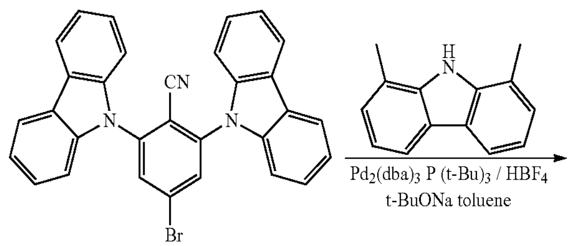
^{1}H-NMR (500 MHz, $CDCl_3$, δ): 8.16 (d, J=7.5 Hz, 4H), 7.94 (s, 2H), 7.52 (td, J=9.4 Hz, J=1.2 Hz, 4H), 7.38 (td, J=8.0 Hz, J=1.0 Hz, 8H)

ASAP mass spectrum analysis:

Theoretical value: 512.4

Observed value: 512.4

Subsequently, a compound 135 was synthesized by the following reaction.



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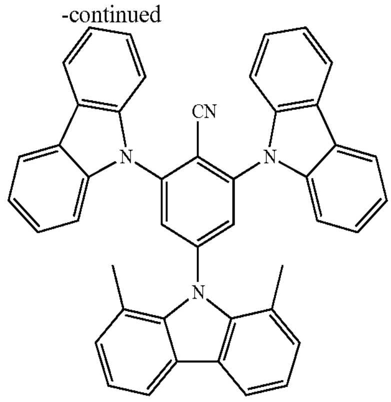


Compound 135

4-bromo-2,6-di(9H-carbazole-9-il)benzonitrile (0.300 g, 0.585 mmol), 1,8-dimethyl-9H-carbazole (0.125 g, 0.643 mmol), sodium tert-butoxide (0.170 g, 1.76 mmol), tris (dibenzylideneacetone) dipalladium (O) (54.0 mg, 0.0585 mmol) and tetrafluoroborate tri-tert-butylphosphine (17.0 g, 0.0585 mmol) were added to a 100 mL three-neck flask having been substituted with nitrogen. The mixture was added with 50 mL of dehydrated toluene and stirred under heating at 120° C. for 12 hours. After the stirring, the mixture was returned to room temperature, added with chloroform and water, and stirred. After the stirring, the mixture was rinsed with saturated saline. After the rinsing, the mixture was added with anhydrous magnesium sulfate and dried. Then, the mixture was subjected to suction filtration for concentration, so that filtrate was obtained. The obtained filtrate was purified by silica gel column chromatography with hexane:chloroform (=6:4) as a developing solvent. The obtained fraction was concentrated, so that the white solid matter of the target material was obtained in a yield amount of 0.170 mg and a yield of 46.3%.

^{1}H NMR (500 MHz, $CDCl_3$, δ): 8.15 (d, J=7.6 Hz, 4H), 7.95 (dd, 2.0 Hz, 2H), 7.93 (s, 2H), 7.52 (td, J=7.7 Hz, J=1.2 Hz, 4H), 7.39-7.33 (m, 8H), 7.22-7.17 (m, 4H), 2.35 (s, 6H)

ASAP mass spectrum analysis:

Theoretical value: 626.8

Observed value: 626.8

Example 1

Preparation and Evaluation of Organic Photoluminescent Device Using Compound 291

A toluene solution of the compound 291 (concentration: 1×10^{-5} mol/L) was prepared in a glove box under an Ar atmosphere.

For the toluene solution of the compound 291, the light emission spectrum and the light absorption spectrum measured with excitation light of 337 nm are shown in FIG. **2**, and the transient decay curve measured with excitation light of 280 nm after bubbling with argon is shown in FIG. **3**. In FIG. **2**, the solid line shows the light emission spectrum, and the broken line shows the light absorption spectrum. The photoluminescence quantum efficiency was 4.60% for the toluene solution before bubbling, and 10.4% for the toluene solution after bubbling with argon. A fluorescent light component rapidly attenuated and a delayed fluorescent light component slowly attenuated were confirmed from FIG. **3**, in which the light emission lifetime of the fluorescent light component rapidly attenuated was 12.0 ns (nanosecond), and the light emission lifetime of the delayed fluorescent light component was 8.72 μs.

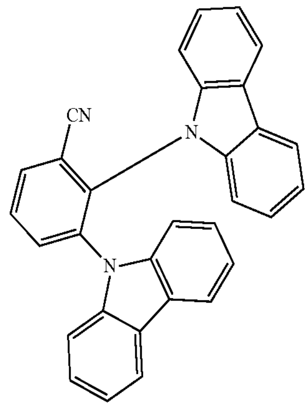
It was confirmed from the results that the compound 291 was a compound capable of emitting delayed fluorescent light and had a high light emission efficiency.

Comparative Example 1

Preparation and Evaluation of Organic Photoluminescent Device Using Comparative Compound 1

A toluene solution (concentration: 1×10^{-5} mol/L) was prepared under the same condition as in Example 1 except that the comparative compound 1 shown by the following formula was used instead of the compound 291.

Comparative Compound 1



For the toluene solution of the comparative compound 1, the transient decay curve measured with excitation light of 280 nm after bubbling with argon is shown in FIG. **4**. The photoluminescence quantum efficiency was 8.60% for the toluene solution before bubbling, and 10.7% for the toluene solution after bubbling with argon. A delayed fluorescent light component was not confirmed from FIG. **4**, and only the fluorescent light component rapidly attenuated (light emission lifetime: 4.10 ns) was observed.

Example 2

Preparation and Evaluation of Organic Photoluminescent Device Using Compound 241

The compound 241 was used instead of the compound 291, and a toluene solution (concentration: 1×10^{-5} mol/L) was prepared under the similar condition to Example 1.

For the toluene solution of the compound 241, the light emission spectrum and the light absorption spectrum measured with excitation light of 337 nm are shown in FIG. **5**, and the transient decay curve measured with excitation light of 280 nm after bubbling with argon is shown in FIG. **6**. In FIG. **5**, the solid line shows the light emission spectrum, and the broken line shows the light absorption spectrum. The photoluminescence quantum efficiency was 10.3% for the toluene solution before bubbling, and 100% for the toluene solution after bubbling with argon. A fluorescent light component rapidly attenuated and a delayed fluorescent light component slowly attenuated were confirmed from FIG. **6**, in which the light emission lifetime of the fluorescent light component rapidly attenuated was 15.4 ns, and the light emission lifetime of the delayed fluorescent light component was 3.54 μs.

It was confirmed from the results that the compound 241 was a compound capable of emitting delayed fluorescent light and had a high light emission efficiency.

Example 3

Preparation and Evaluation of Organic Photoluminescent Device Using Compound 135

The compound 135 was used instead of the compound 291, and a toluene solution (concentration: 1×10^{-5} mol/L) was prepared under the similar condition to Example 1.

For the toluene solution of the compound 135, the light emission spectrum and the light absorption spectrum measured with excitation light of 337 nm are shown in FIG. **7**, and the transient decay curve measured with excitation light of 340 nm after bubbling with argon is shown in FIG. **8**. In FIG. **7**, the solid line shows the light emission spectrum, and the broken line shows the light absorption spectrum. The photoluminescence quantum efficiency was 7.6% for the toluene solution before bubbling, and 100% for the toluene solution after bubbling with argon. A fluorescent light component rapidly attenuated and a delayed fluorescent light component slowly attenuated were confirmed from FIG. **8**, in which the light emission lifetime of the fluorescent light component rapidly attenuated was 6.5 ns, and the light emission lifetime of the delayed fluorescent light component was 37 μs.

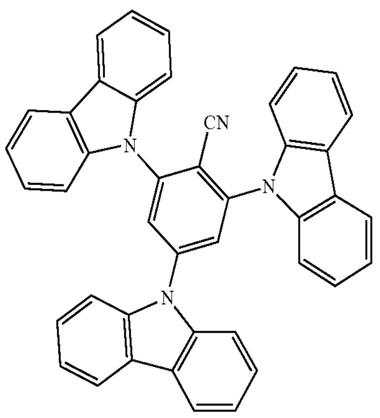
It was confirmed from the results that the compound 135 was a compound capable of emitting delayed fluorescent light and had a high light emission efficiency.

Comparative Example 2

Preparation and Evaluation of Organic Photoluminescent Device Using Comparative Compound 2

A toluene solution (concentration: 1×10^{-5} mol/L) was prepared under the same condition as in Example 1 except that the comparative compound 2 shown by the following formula was used instead of the compound 291.

Comparative Compound 2



For the toluene solution of the comparative compound 2, the transient decay curve measured with excitation light of 280 nm after bubbling with argon is shown in FIG. **9**. The photoluminescence quantum efficiency was 14.4% for the toluene solution before bubbling, and 18.9% for the toluene solution after bubbling with argon. A delayed fluorescent light component was not confirmed from FIG. **9**, and only the fluorescent light component rapidly attenuated (light emission lifetime: 3.75 ns) was observed.

INDUSTRIAL APPLICABILITY

The compound of the invention is useful as a light-emitting material. Accordingly, the compound of the invention may be effectively used as a light-emitting material of an organic light-emitting device, such as an organic electroluminescent device. The compound of the invention includes a compound that emits delayed fluorescent light, and thus is capable of providing an organic light-emitting device having a high light emission efficiency. Accordingly, the invention has high industrial applicability.

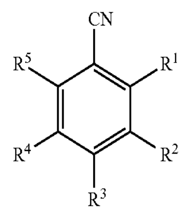
REFERENCE SIGNS LIST

1 substrate
2 anode
3 hole injection layer
4 hole transporting layer
5 light-emitting layer
6 electron transporting layer
7 cathode

The invention claimed is:

1. A compound having a structure represented by the following general formula (1):

General Formula (1)



wherein:

one or more of R^1, R^2, R^3, R^4, and R^5 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position, the balance thereof represents a hydrogen atom or a substituent, provided that the substituent excludes a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position;

two to four of R^1, R^2, R^3, R^4, and R^5 each independently represent a substituted or unsubstituted 9-carbozolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group; and

R^2 and R^4 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group, and at least one of R^1, R^3 and R^5 is a hydrogen atom, or alternatively R^2 and R^4 are a hydrogen atom; and

one or more of carbon atoms constituting ring skeletons of all of said respective 9-carbazolyl group, all of said respective 10-phenoxazyl group, and the 10-phenothiazyl group may be replaced by a nitrogen atom.

2. The compound according to claim **1**, wherein the substituent represents a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted thioalkoxy group, a substituted or unsubstituted aryl group, a substituted or unsubstituted heteroaryl group, a substituted or unsubstituted aryloxy group, a substituted or unsubstituted heteroaryloxy group, a substituted or unsubstituted thioaryloxy group, a substituted or unsubstituted thioheteroaryloxy group, a secondary amino group, a tertiary amino group, or a substituted or unsubstituted silyl group.

3. The compound according to claim **1**, wherein R^1, R^3, and R^5 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group.

4. The compound according to claim **3**, wherein R^3 represents a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position.

5. The compound according to claim **4**, wherein R^1 and R^5 each independently represent a 9-carbazolyl group unsubstituted at the 1-position and the 8-position, a 10-phenoxazyl group unsubstituted at the 1-position and the 9-position or a 10-phenothiazyl group unsubstituted at the 1-position and the 9-position.

6. The compound according to claim **1**, wherein R^2 and R^4 each independently represent a substituted or unsubstituted 9-carbazolyl group, a substituted or unsubstituted 10-phenoxazyl group or a substituted or unsubstituted 10-phenothiazyl group.

7. The compound according to claim **6**, wherein R^2 and R^4 each independently represent a 9-carbazolyl group having a substituent at at least one of 1-position and 8-position, a 10-phenoxazyl group having a substituent at at least one of 1-position and 9-position or a 10-phenothiazyl group having a substituent at at least one of 1-position and 9-position.

8. An organic light-emitting device containing a substrate having thereon a light-emitting layer containing the compound according to claim **1**.

9. The organic light-emitting device according to claim **8**, wherein the organic light-emitting device is an organic electroluminescent device.

10. The organic light-emitting device according to claim **8**, wherein the light-emitting layer contains the compound and a host material.

11. The organic light-emitting device according to claim **8** which emits a delayed fluorescence.

* * * * *

专利名称(译)	化合物，发光材料和有机发光装置		
公开(公告)号	[US10510977](US10510977)	公开(公告)日	2019-12-17
申请号	US16/066718	申请日	2016-12-28
[标]申请(专利权)人(译)	国立大学法人九州大学		
申请(专利权)人(译)	KYULUX，INC. KYUSHU大学，国立大学公司		
当前申请(专利权)人(译)	KYULUX，INC. KYUSHU大学，国立大学公司		
[标]发明人	NASU KEIRO ADACHI CHIHAYA NAKANOTANI HAJIME YANG YUSEOK NOMURA HIROKO		
发明人	NASU, KEIRO ADACHI, CHIHAYA NAKANOTANI, HAJIME YANG, YUSEOK NOMURA, HIROKO		
IPC分类号	H01L51/50 H01L51/00 H01L51/52 C07D209/86		
CPC分类号	H01L51/5221 H01L51/5096 C07D209/86 H01L51/0072 H01L51/5016 H01L51/5206 H01L51/5092 H01L51/5056 H01L51/5012 H01L51/5072 C09K11/06 C09K2211/1029 H01L51/0067 H01L51/50		
优先权	2015256571 2015-12-28 JP 2016079893 2016-04-12 JP		
其他公开文献	US20190016704A1		
外部链接	Espacenet		

摘要(译)

具有由以下通式表示的结构的化合物发射延迟的荧光，并且可用作发光材料。 R1，R2，R3，R4和R5 中的一个或多个表示在1位和8位中的至少一个上具有取代基的9-咔唑基 或在1-位和9-位中的至少一个上具有取代基的10-苯恶唑基或10-吩噻唑基。 其余额代表氢原子或取代基。