

(19)
(12)

(KR)
(B1)

(51) 。 Int. Cl.⁷
C07D 417/14
C09K 11/06

(45)
(11)
(24)

2004 04 27
10-0428642
2004 04 12

(21) 10-2001-0023038
(22) 2001 04 27

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(43)

10-2002-0083614
2002 11 04

(73) 20

(72) 107 703

LG 8 405

302 904

108 110

247-184

128 405

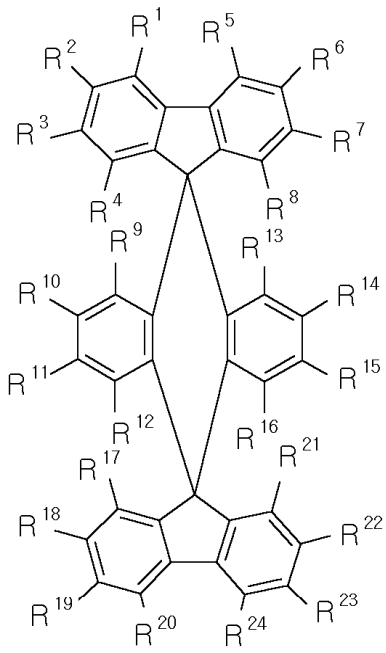
LG 7 403

381-42LG 8 107

(74)
:

(54)

(carrier) (double spiro) , 가 , ,
(mobility) , 가 , ,
[1] 1 :



(double spiro) 가 1

(dopant)

1

1
2
1 , 2 , 3 , 4 , 5 , 6
, 7

(carrier) (double spiro) 가 ,
(mobility) 가
()

(full color) (shadow mask) (pixel)
4,359,507
가
가 (glass transition temperature)가
가 (group) 가
(trap), (pi-orbital) (overlap) (carrier)
(molecular orbital) ?? (quenching site), (eximer)
(Kodak) 4,356,429 (copper phthalocyanine)
CuPc) 가 가
가 가 (ph
enyl) (naphtyl) (5,554,450).
가 4,4'- [N-(1-)-N-] (4,4'-bis[N-(1-naphtyl)- N-phenyl-amino]bip
henyl; NPB) (spiro)
가 (5,840,217).
e aluminum salt; Alq3) 가 8- (8-hydroxyquinolin
Alq3 5,516,577 , 5,366,811
가 가 (5,840,217). 5 (spiro)
90 (biphenyl)
(Kodak) (fused)
(imidazole) (5,150,006 , 5,645,948).
가 (doping)
가 (energy transfer) (exciton)
(band gap) (host) (4,769,292).
(band-gap) (band-gap)
가 (excimer)
가 (pi-orbital)
(perylene), (anthracene), (quinacridone), (coumarine),
(rubrene), Nile Red, DCM,
가

가

Alq

3가

bility)

가

(carrier)

(mo

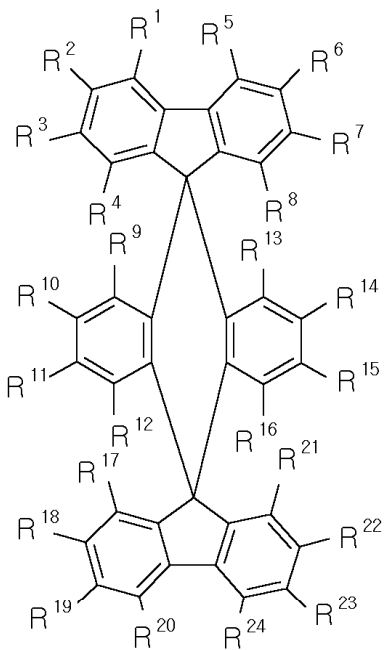
가

가

OPC(optical photo conductor)

(organic transistor)

[1]



R¹ ~ R²⁴ ; R¹ ~ R²⁴
 R¹ ~ R²⁴

X
 1 20 ; ; (arylamine); ; (nitrile, -CN);
 (acetylene);
 (thiazole), (oxazole), (imidazole), (thiophene)
 ;
 1 (moiety)

R¹⁰, R¹¹, (F), (Cl), (Br), (I), R¹⁴, R¹⁵, R¹⁰, R¹¹, R¹⁴, R¹⁵

X

(-CN); (moiety)

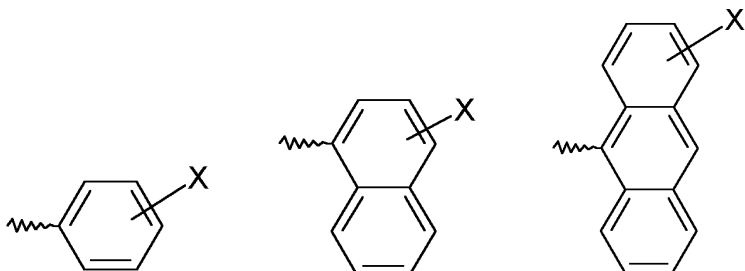
(1) (2) (1) (2) 가 (1) (2) (indium tin oxide), (indium zinc oxide), (tin oxide), (work function) 가

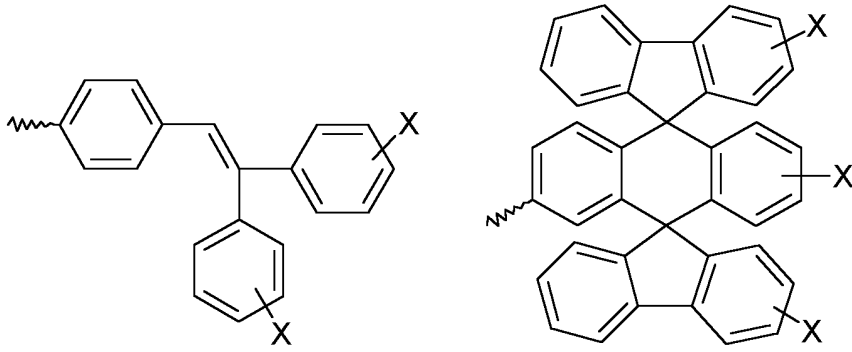
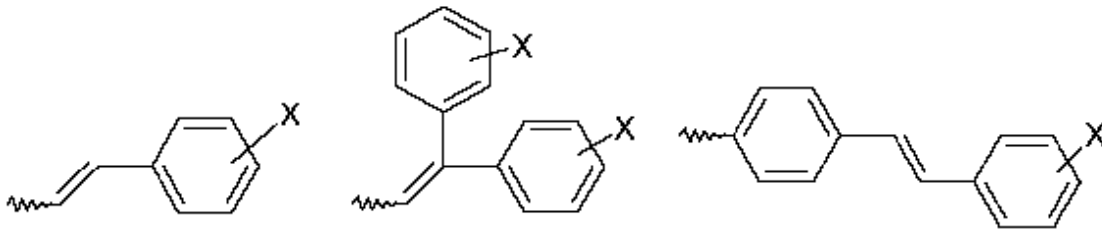
(2) (4) (3) (4) (5) (4) (5) (3) 가 (Al), (Mg), (Ag), (Ca), (Li), (LiF/Al), (Mg:Ag), (Li:Al), (Li₂O/Al), (1-20) 가 (2) (5)

2 (7), (5) 2 (1), (2), (3) 1 (2), (3) (6), (4), (2) (2) (6) (2) (4) (5) (7) 가

1 2 1 2 1 (aromatic carbinol) , R¹ ~ R²⁴ 가 (J. Am. Chem. Soc., 52, 2881, 1930). (double spiro)

R¹ ~ R²⁴ 가





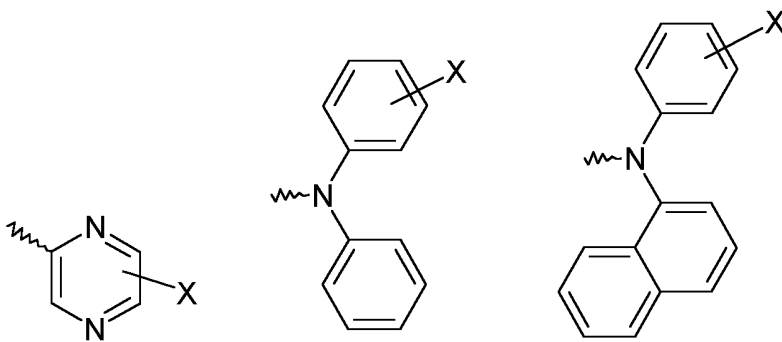
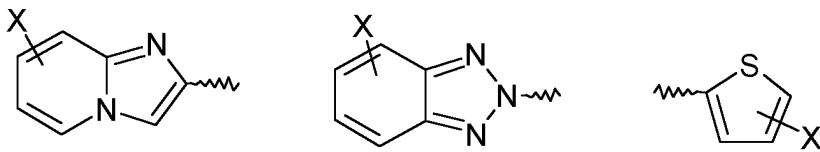
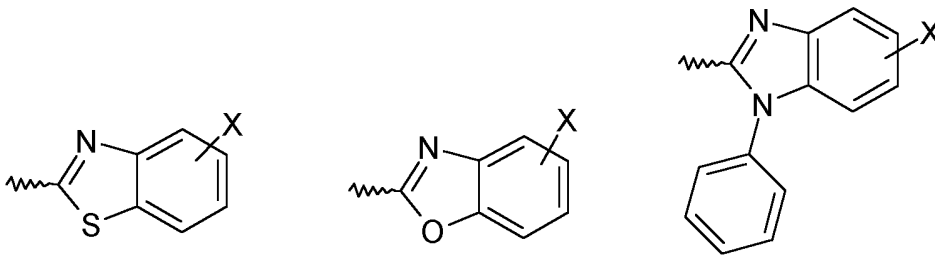
ing) R₁ ~ R₂₄ 가

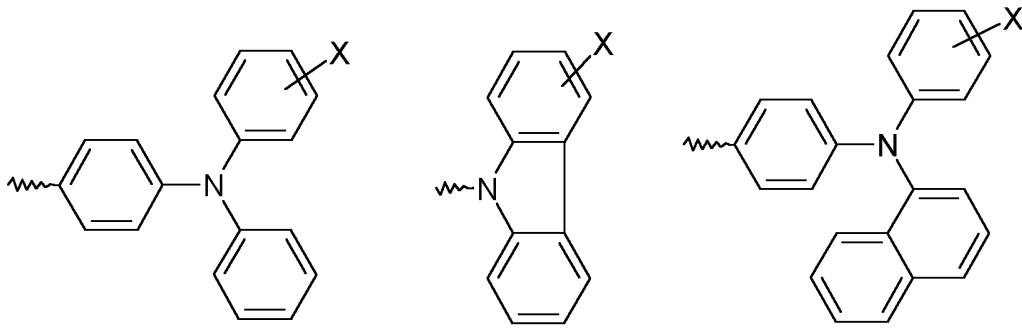
(arylamine); (nitride, -CN); 가

1 20 (thiazole), (acetylene);

X (oxazole), 1 (imidazole) 가 ; ;

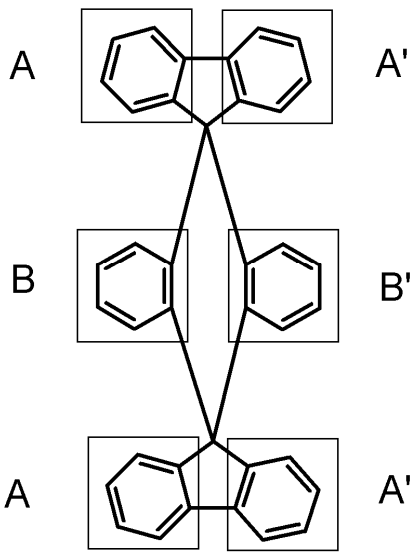
(fused) (fused r





X X 가 1a

[1a]



rogen atom)
yl) 가

1 1a R₁ ~ R₂₄ 가 (Hyd phen)

A, A', B, B' A, A', B, B'

(phenyl) A, A' 가 B, B' 가

(excimer) A, A' B, B'

(C₁ ~ C₂₀) 가

1 A, A', B, B' (aryl amine)

(carrier) (carrier mobility) 가

1

1a

A, A', B, B'

(mobility)

(carrier)

(doping) 가

(doping) (band gap)

가 (eximer)

1

B, B' , A, A'

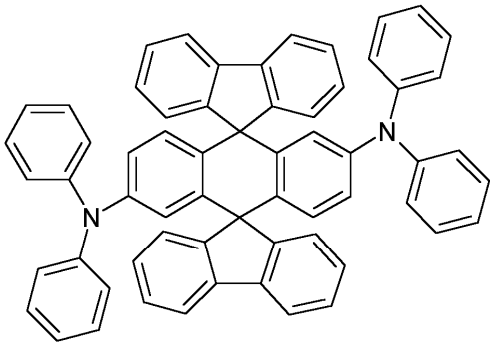
B, B'

B, B'

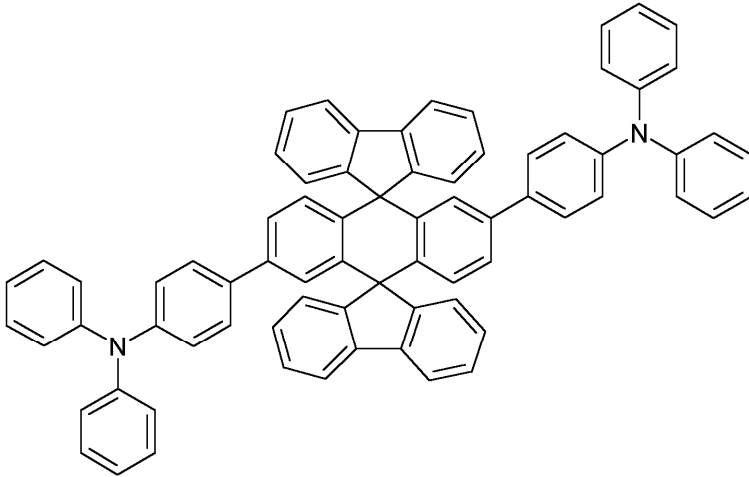
가

2 25

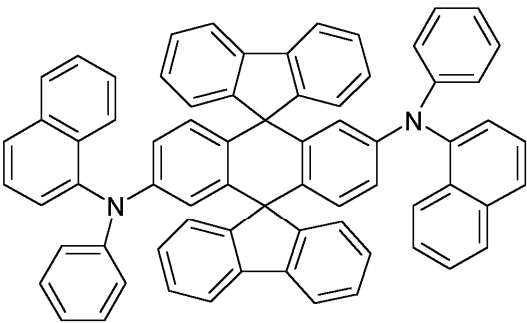
[2]



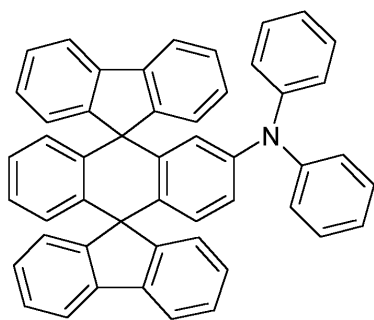
[3]



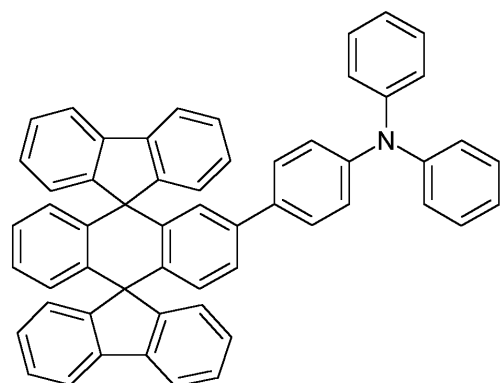
[4]



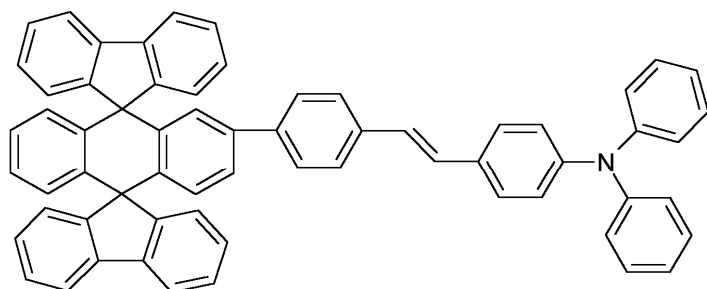
[5]



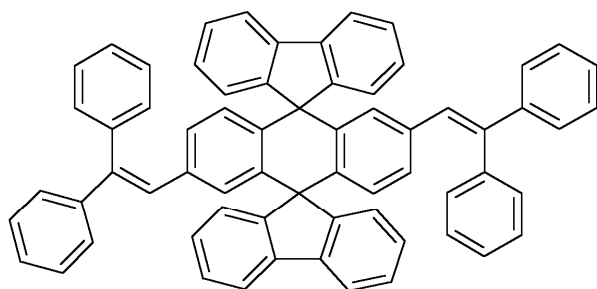
[6]



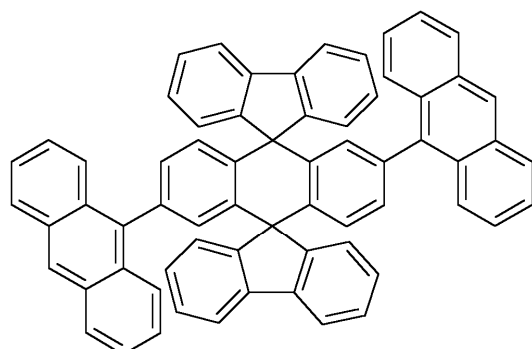
[7]



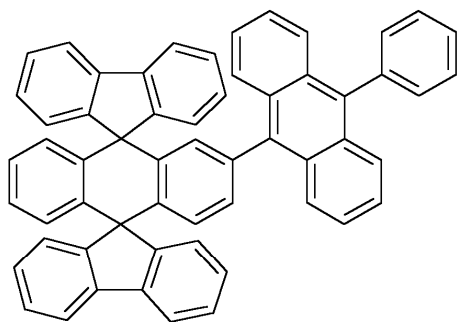
[8]



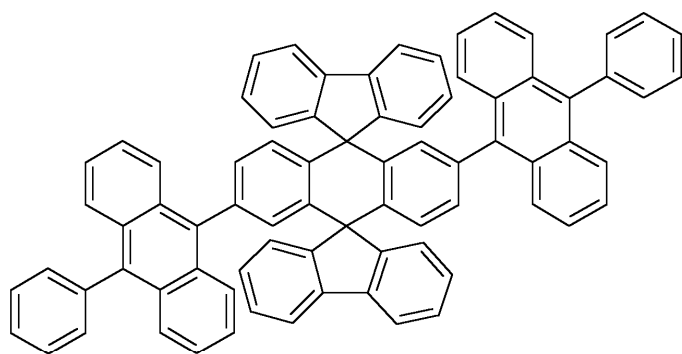
[9]



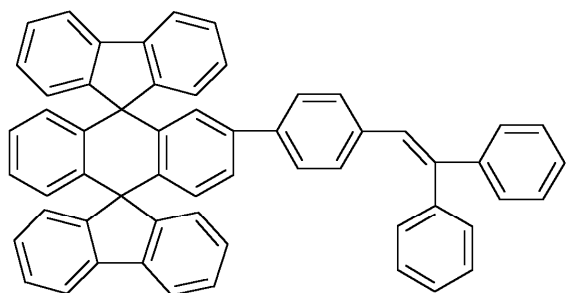
[10]



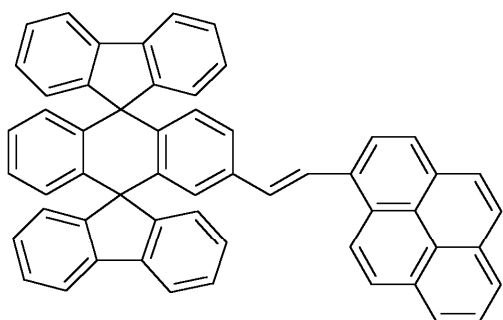
[11]



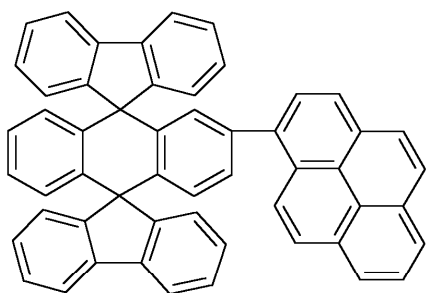
[12]



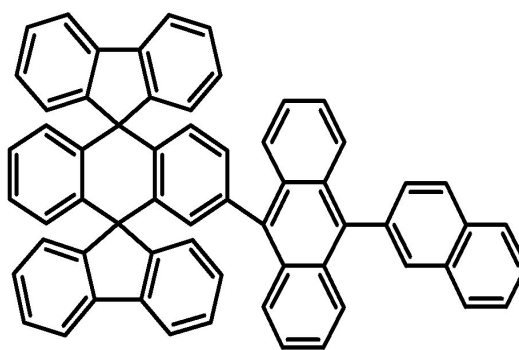
[13]



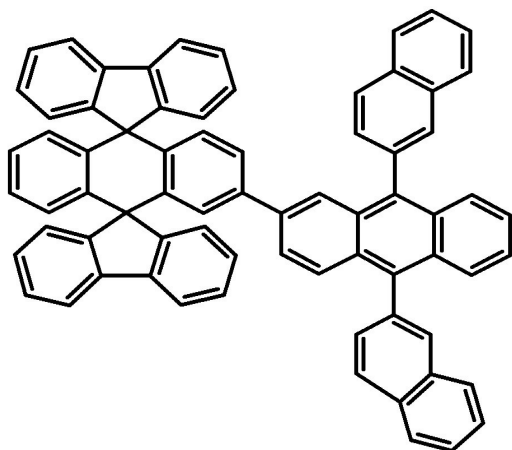
[14]



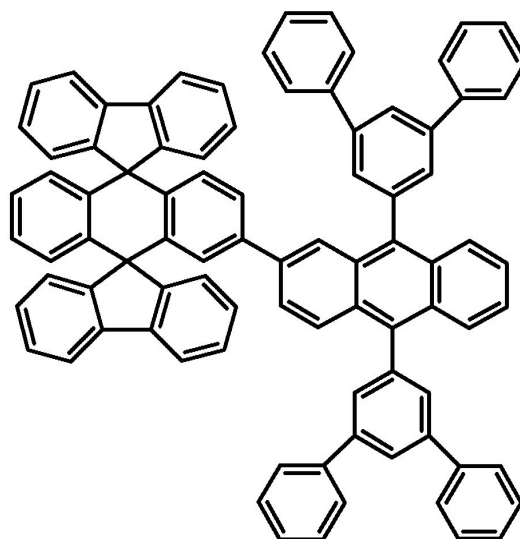
[15]



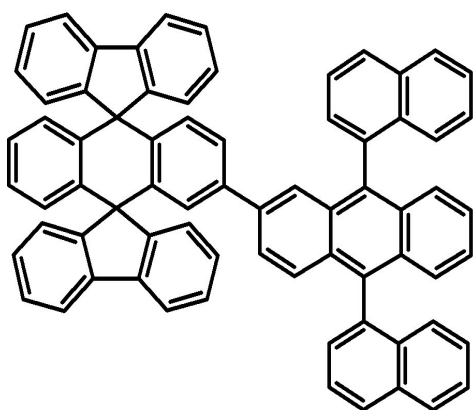
[16]



[17]



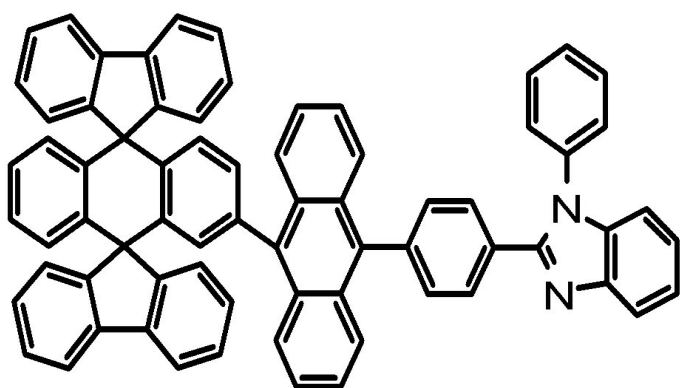
[



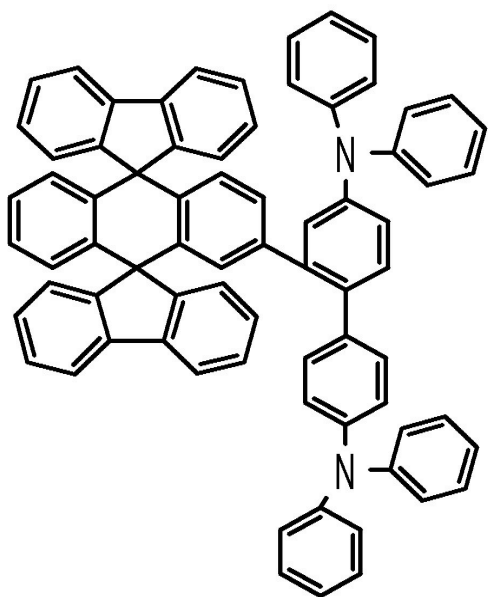
18]

[

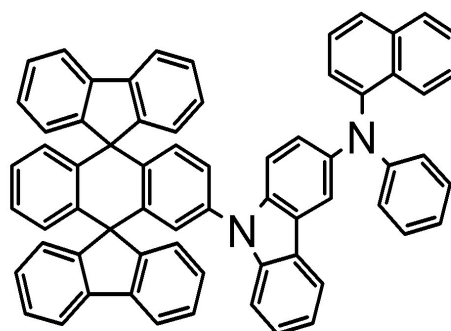
19]



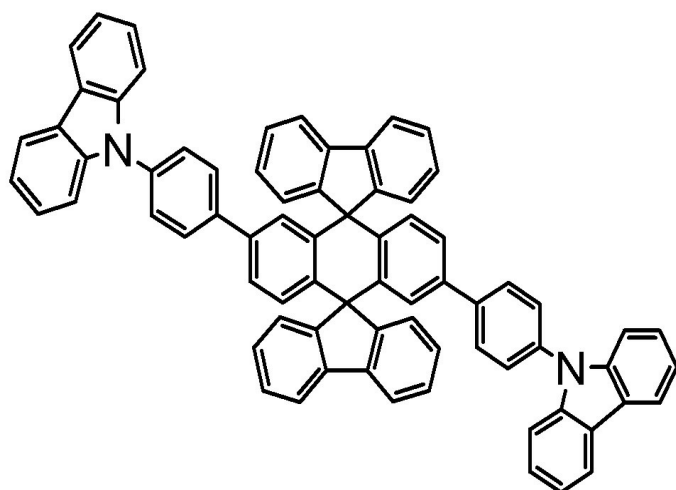
[20]



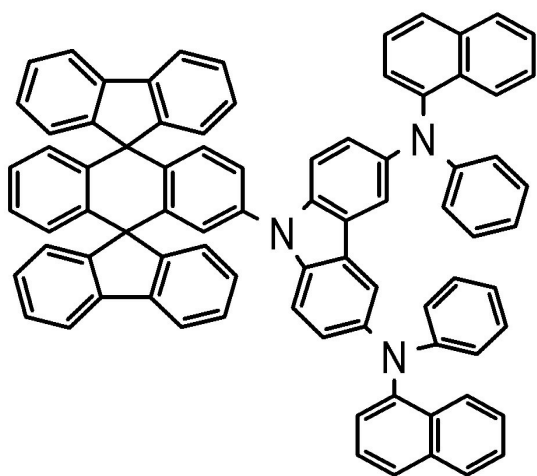
[21]



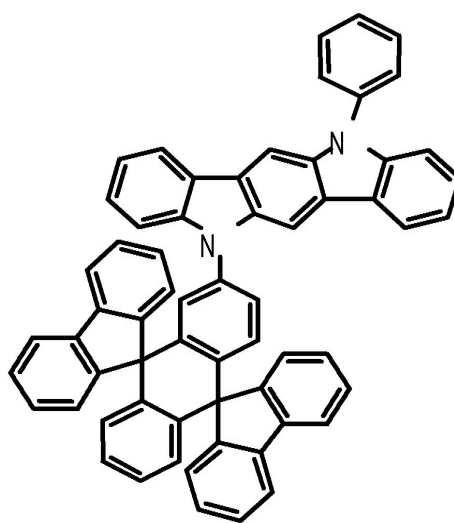
[22]



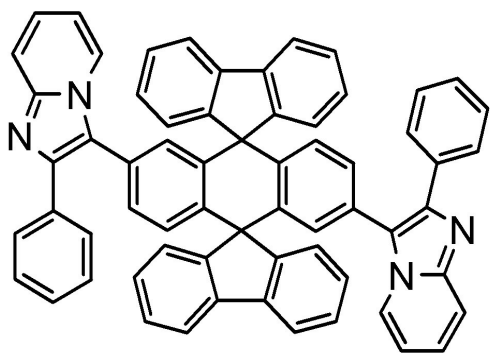
[23]



[24]



[



25]

1

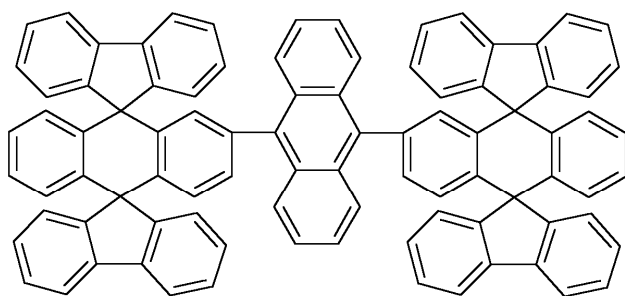
2

2

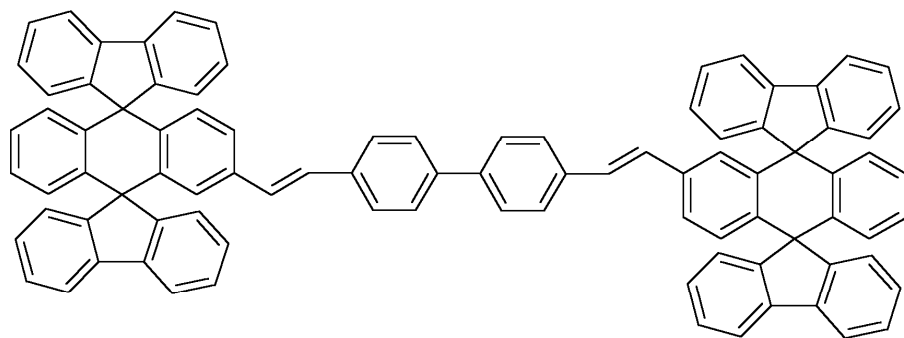
26,

27

[26]



[27]



1

1a

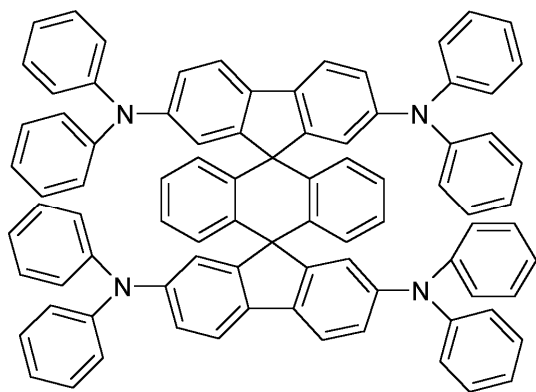
A, A'

(pi-orbital)

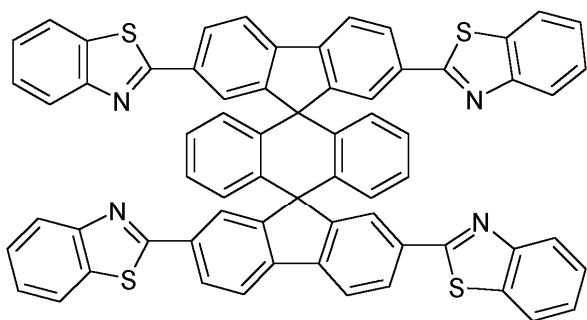
[28]

28

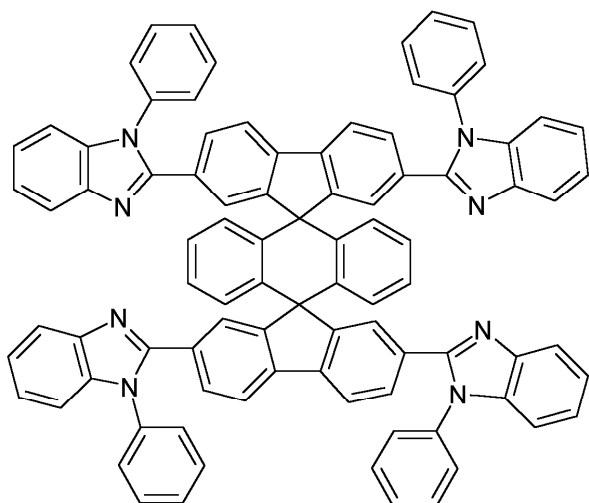
33



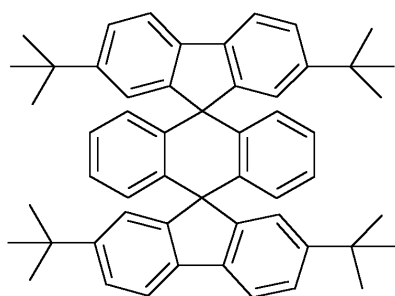
[29]



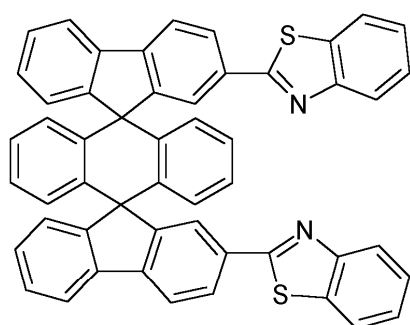
[30]



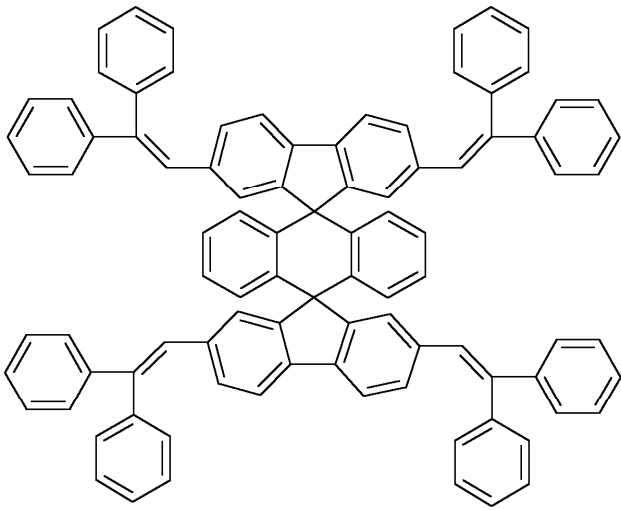
[31]



[32]



[33]

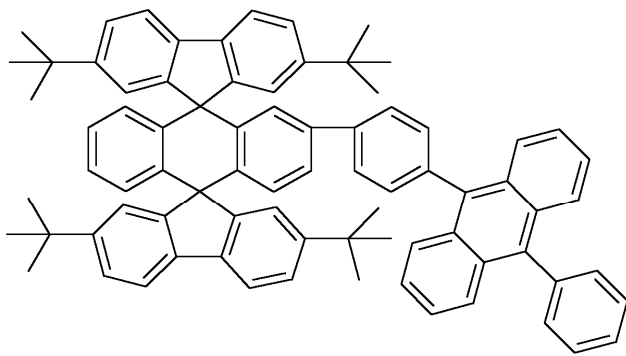


1a, A, A'

B, B' 34

A, A' B,

B' [34]



1a, B, B'

1 가

-coating),

(screen-printing),

(ink-jet printing)

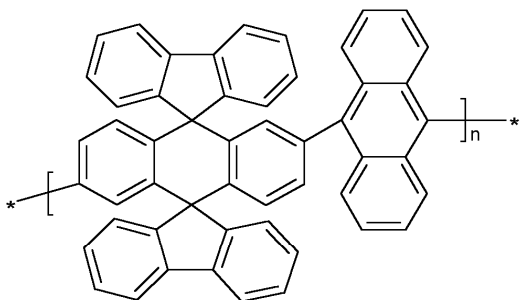
(spin-coating),

(roll

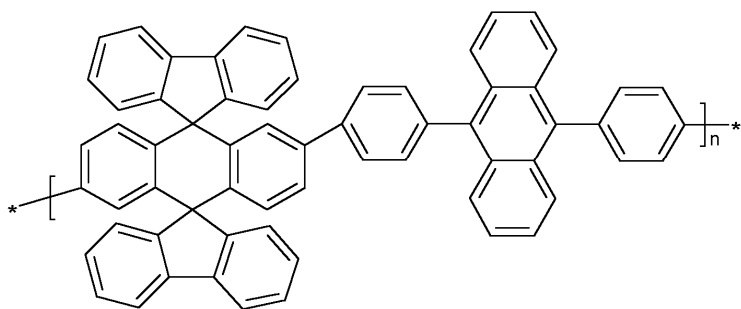
35 37
35 37

n 2

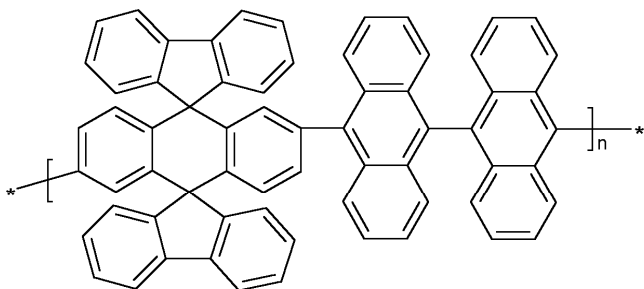
[35]



[36]



[37]



1

가

가

가

(organic solar cell),
o conductor)

1

(solar cell),
(organic transistor)

OPC(optical phot

[]

1

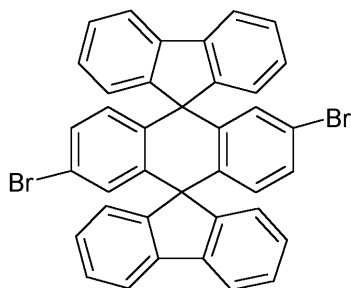
가

1
(38)

1

38

[38]



2- (2-Bromobiphenyl) 5.0 g(21.5 mmol) THF 50 Mℓ -78
 (t-BuLi) 32 Mℓ(1.7 M in pentane) 가
 1 2,6- (2,6-dibromoanthraquinone) 3 g(8.2 mmol) 가
 30 (Diethylether) 30 Mℓ 2 N 50 Mℓ 30
 5.1 g 60 Mℓ (5) (35 %)
 3 가 4.6 g (: 88 %).
 38 NMR

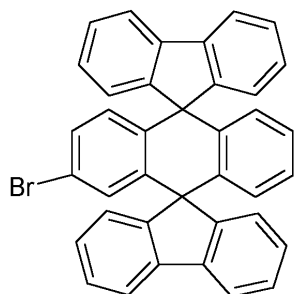
¹H NMR (300 MHz, DMSO-d₆) δ 8.12 (4H, d), 7.52 (4H, t), 7.32 (4H, t), 7.06 (4H, d), 6.84 (2H, d), 6.28 (2H, s), 6.16 (2H, d)

2

(39)

39

[39]



THF 35 Mℓ 2.68 g(11.5 mmol) 2- (2-bromobiphenyl) , -78
 (t-BuLi) 16.9 Mℓ(1.7 M in pentane) 가 40
 1.44 g(5 mmol) 2- (2-bromoanthraquinone) 가
 3
 (Diethylether) 15 Mℓ 2 N 25 Mℓ 30
 (diethylether)
 2.5 g 50 Mℓ (10) 3
 39 가

2.2 g (: 79 %).

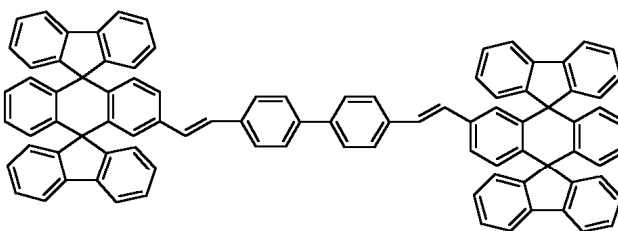
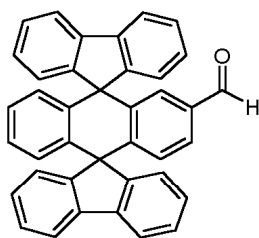
39 NMR

¹ H NMR (300 MHz, CDCl₃) δ 7.9 (4H, m), 7.5-7.4 (4H, m), 7.3 (4H, t), 7.2 (4H, m), 6.9 (1H, d), 6.8 (2H, m), 6.5 (1H, s), 6.3 (2H, m), 6.2 (1H, d)

1

[27] [40] [27]

40



40 1.34 g(2.6 mmol) 4,4'- ()-1,1'- (4,4'-di-(diethylphosphorylmethyl)-1,1'-biphenyl) 0.5 g(1.3 mmol) 80 Mℓ DMF ,
 lithium ethoxide) 2.8 Mℓ(1 M in ethanol) 가 12
 27 (train sublimation)

C (94.9 %), H (5.02 %) / C (94.4 %), H (5.12 %)

: 1162 / : 1163 [M+H]⁺

2

1 1 38

2,2- (2,2-Diphenylvinylboronic acid) 1.34 g(6 mmol), 1 27
 가 0.36 g(0.75 mmol), Pd (PPh₃)₄ 0.086 g(0.075 mmol), 2 N K₂CO₃ 10 Mℓ,
 20 Mℓ 24

8 가 2 Mℓ 가 4.2 g
 (: 75 %).

C (94.70 %), H (5.30 %) / C (94.3 %), H (5.4 %)

- : 836 / : 837 [M+H]⁺
 - : 387.7
3
 1 2 39 29

39 가 5.6 g(10.0 mmol) 60 Mℓ THF , 78
 - (t-BuLi; t-butyl lithium 17.6 Mℓ(1.7 M in pentane) 가 .
 4.5 Mℓ (trimethylborate) 가 3
 1 N 150 Mℓ 가 1.5

0.16 g K₃PO₄, 0.2 g DMF 0.06 g 9,10- (9,10-dibromoanthracene),
 12 mg Pd(PPh₃)₄ 가 60 18
 가 50 Mℓ NMP 20 Mℓ 가 30
 가 26 0.16 g (: 41 %), (train sublimation)

26
 - :
 C (95.2 %), H (4.79 %) / C (94.9 %), H (4.70 %)

- :
 : 1134 / : 1135 [M+H]⁺
4
 1 2 39 10

39 가 5.6 g 60 Mℓ THF 78 -
 (t-BuLi; t-butyl lithium 17.6 Mℓ(1.7 M in pentane) 가 .
 4.5 Mℓ (trimethylborate) 가 .
 3 1 N 150 Mℓ 가 1.5

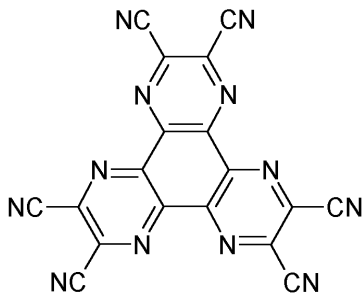
0.52 g 10 Mℓ DMF 0.3 g 9- -10-
 (9-bromo-10-phenylanthracene), 0.42 g K₃PO₄, 35 mg Pd(PPh₃)₄ 가 .
 60 12 20 Mℓ 가 30
 150 Mℓ
 0.26 g 10 (: 35 %), (train sublimation)

10
 - :
 C (95.0 %), H (4.95 %) / C (94.9 %), H (4.83 %)

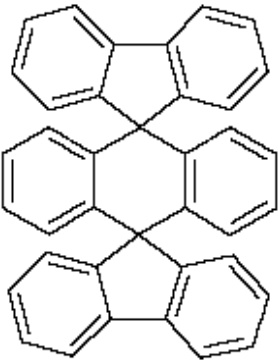
- :
 : 732 / : 733 [M+H]⁺
 1, 5 7 1

1
 ITO(indium tin oxide)가 1500 5

ITO (hexanitride hexaazatriphenylene, HNHATP) 50
 41
 0 [41]



(1 R 1 ~R 24 가) , 42 가
 NPB(600)
 Alq3(400)) 150 .
 [42]



() 5 (LiF) 2500
 sec 3~7 /sec 1 /sec , 0.2 /
 10.1 V 가 , 10 mA/cm² 1931 CIE color coor
 dinate x=0.218, y=0.301 57 nit
5
 ITO(indium tin oxide)가 1500

ITO CuPc(copper phthalocyanine) 150
 6 가 400 NPB(600) 1
 Alq3(200)
 () 5 (LiF) 2500
 ec 3~7 /sec 1 /sec , 0.2 /s
 9.1 V 가 , 10 mA/cm² 1931 CIE color coordi
 nate x=0.159, y=0.089 126 nit
6
 ITO(indium tin oxide)가 1500

ITO 41 HNHATP 500
 26 가 300 NPB(400) , 3
 Alq3 (300)
 () 5 (LiF) 2500
 ec, 3~7 /sec 1 /sec , 0.2 /s
 6.6 V 가 , 10 mA/cm² 1931 CIE color coordi
 nate x=0.184, y=0.242 254 nit
7

ITO(indium tin oxide)가 1500

5
 ITO 41 HNHATP 500
 NPB(400) , 4
 Alq3(300
 10 가 200
)
 () 5 (LiF) 2500
 ec, 3~7 /sec 1 /sec , 0.2 /s
 6.7 V 가 , 10 mA/cm² 1931 CIE color coordi
 nate x=0.172, y=0.156 168 nit
 8
 1 가

ITO(indium tin oxide)가 1500

5
 ITO 41 HNHATP 500
 4 가 400 ,
 Alq3 600
 5 (LiF) 2500 ()
 1 /sec , 0.2 /sec, 3~7 /sec
 7.8 V 가 , 10 mA/cm² 1931 CIE color coordi
 nate x=0.326, y=0.550 464 nit

(double spiro) 가 1

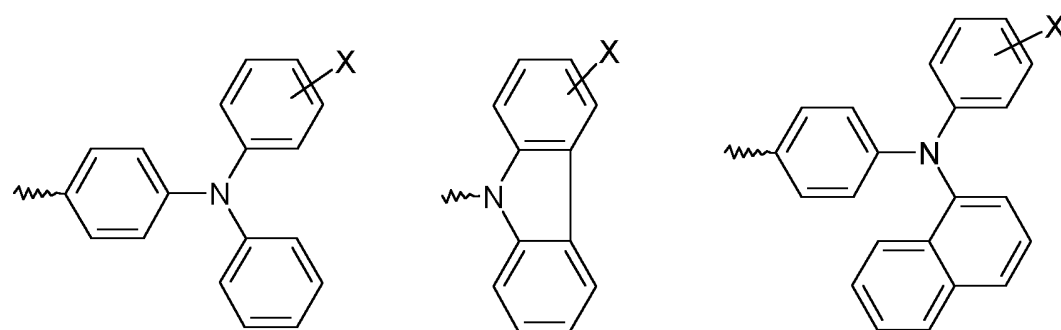
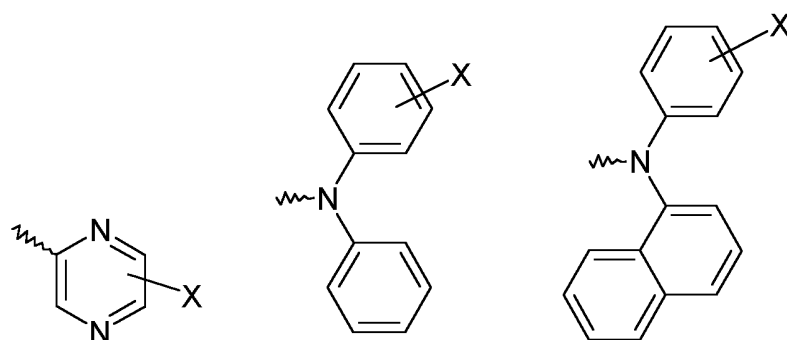
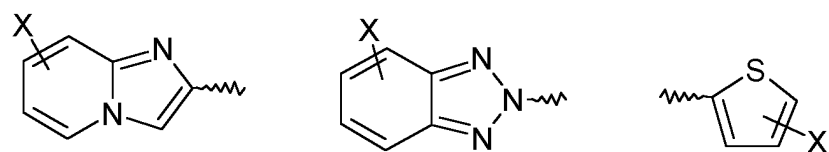
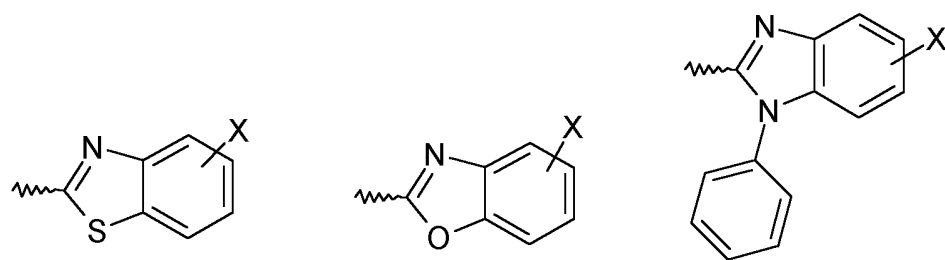
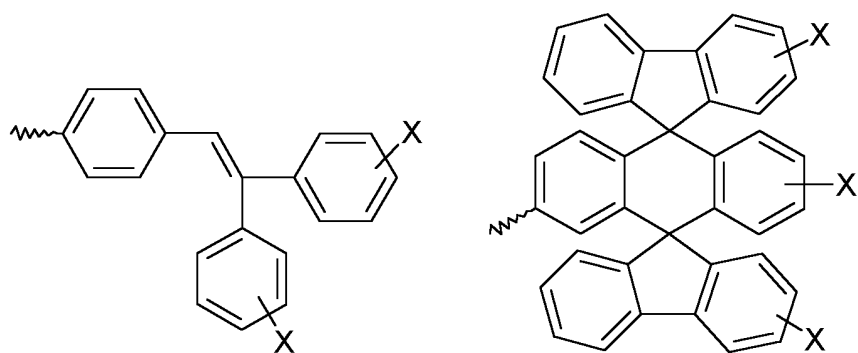
(dopant)

(57)

1.

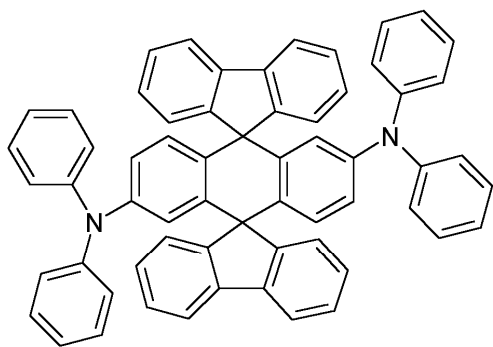
1

[1]



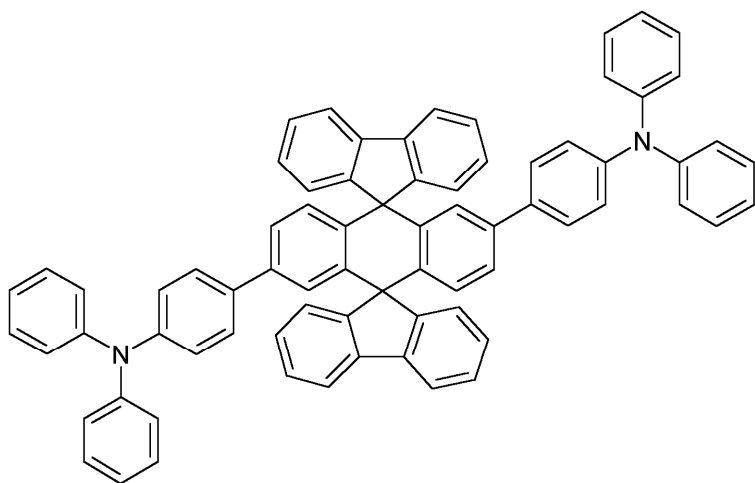
(imidazole); (fused ring) 3;
 (arylamine); (nitrite, -CN); 1, 20;
 (thiazole), (acetylene); (oxazole), 1 (fused)

[2]



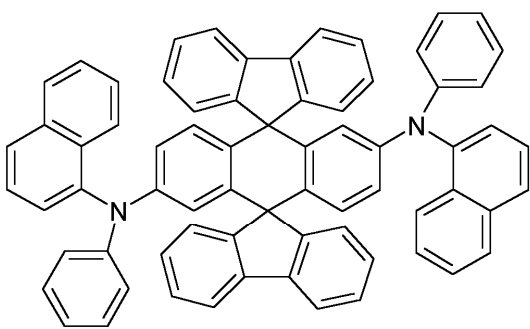
4.

1 3 ,
[3] :



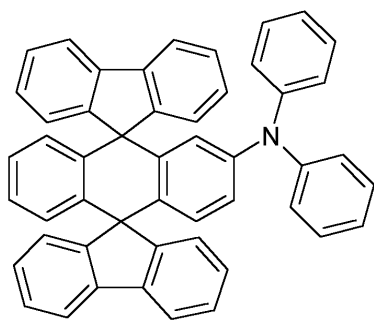
5.

1 4 ,
[4] :



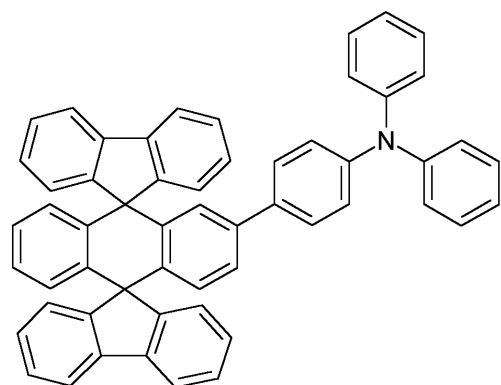
6.

1 5 ,
[5] :



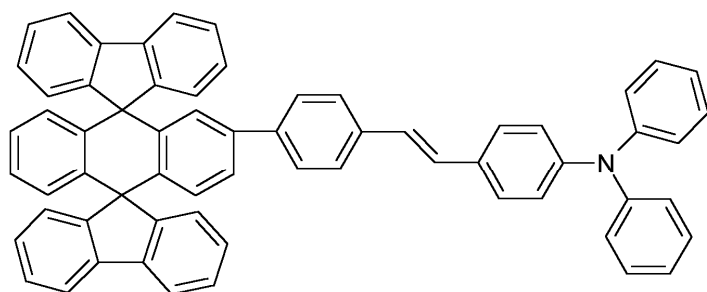
7.

1 6 ,
[6] :



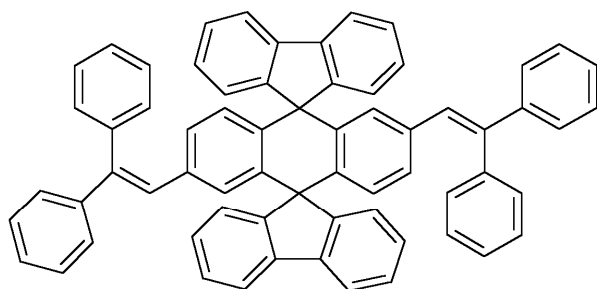
8.

1 7 ,
[7] :



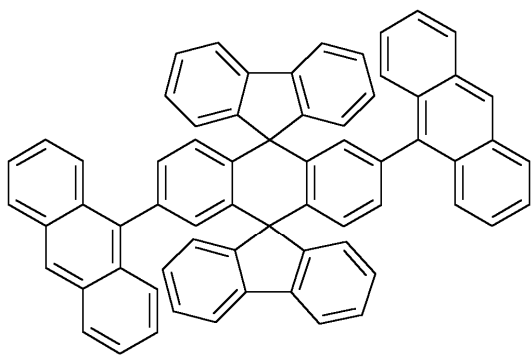
9.

1 8 ,
[8] :



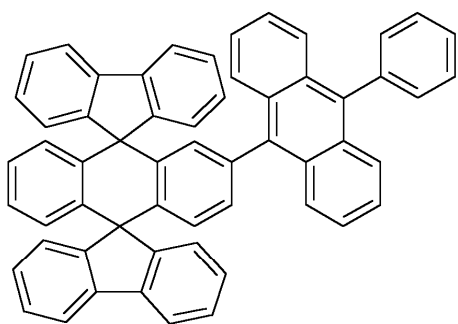
10.

1 9 ,
[9] :



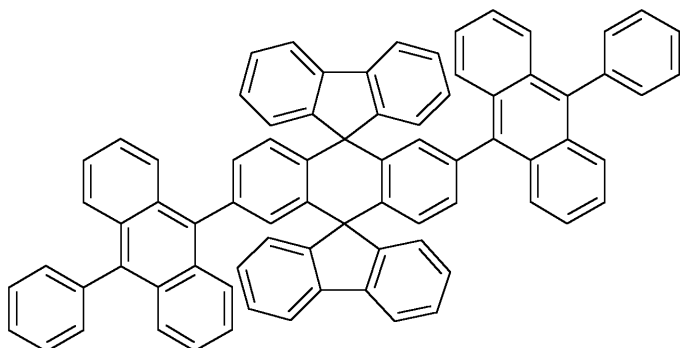
11.

1
[10] , :



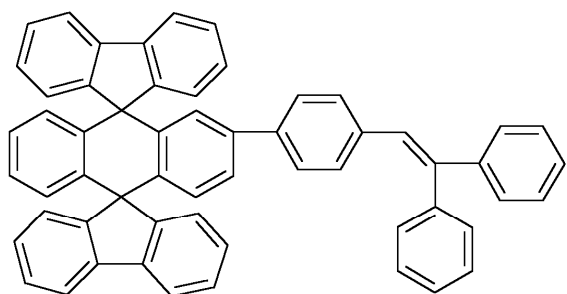
12.

1
[11] , :



13.

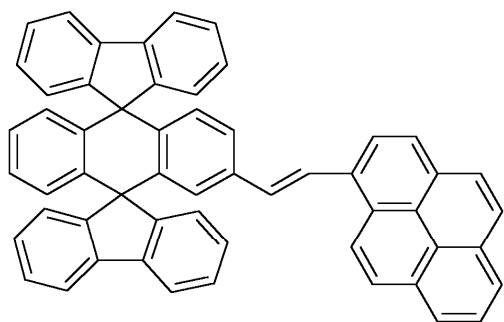
1
[12] , :



14.

1
[13] , :

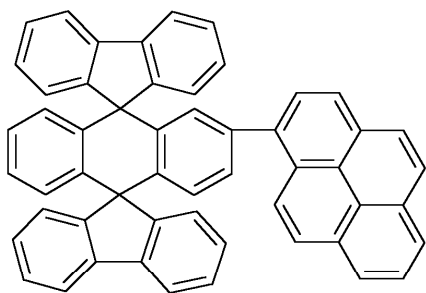
[13]



15.

1 14 :

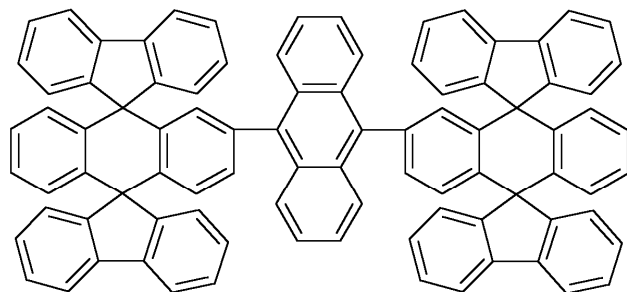
[14]



16.

1 26 :

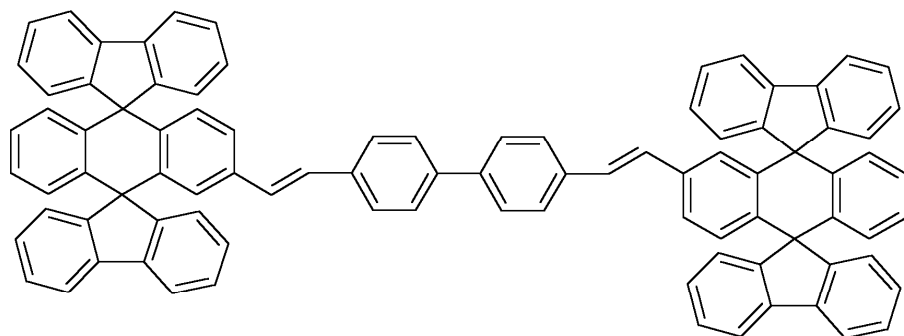
[26]



17.

1 27 :

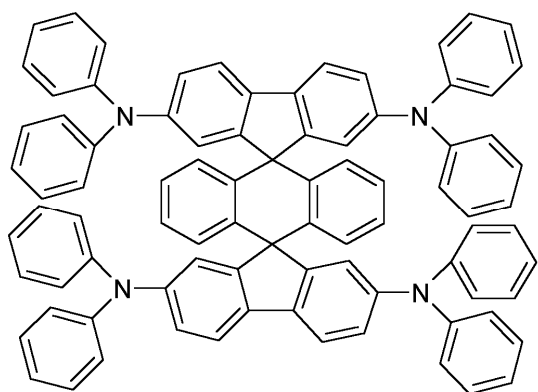
[27]



18.

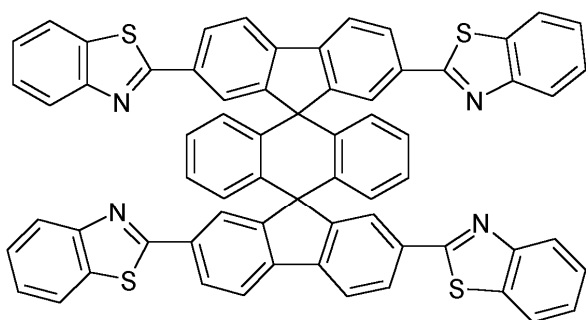
1 28 :

[28]



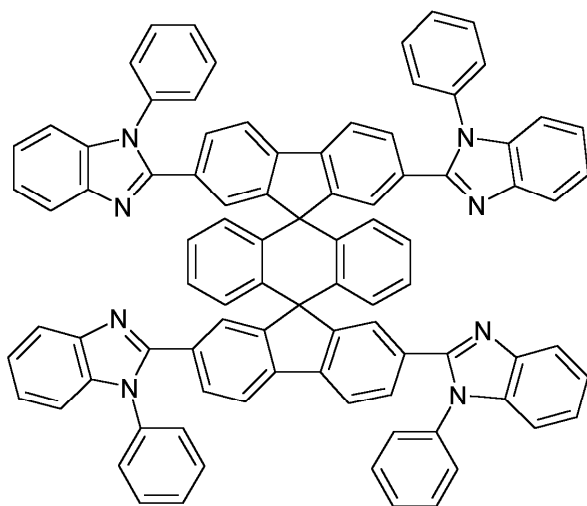
19.

1 29 ,
[29] :



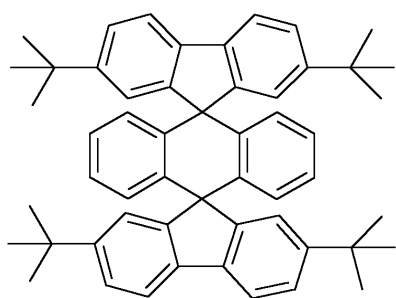
20.

1 30 ,
[30] :



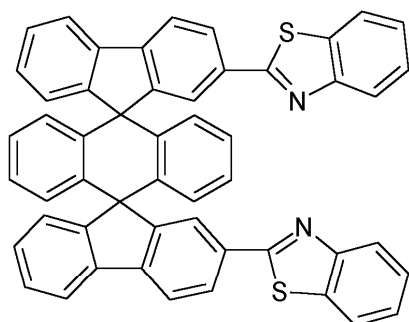
21.

1 31 ,
[31] :



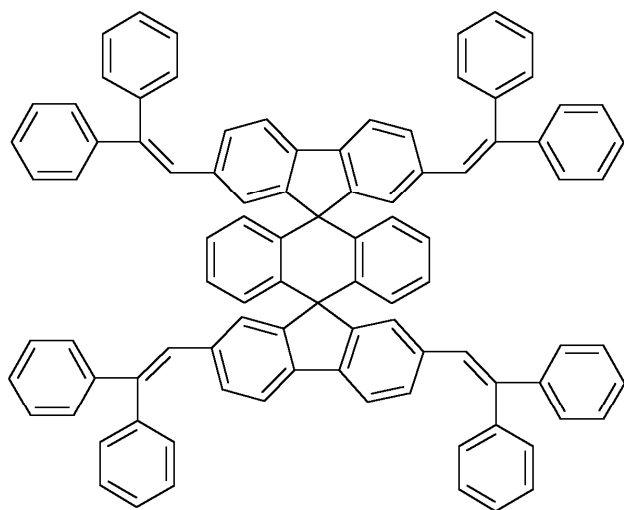
22.

1
[32] 32 :



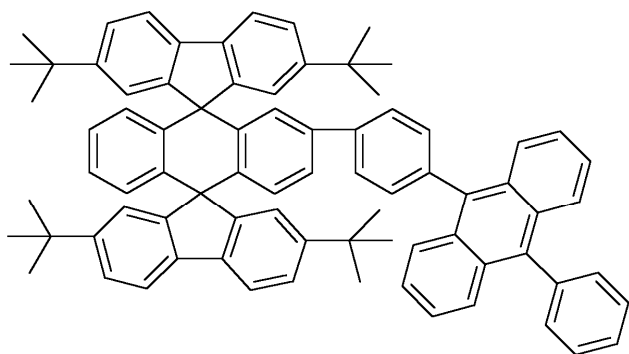
23.

1
[33] 33 :



24.

1
[34] 34 :



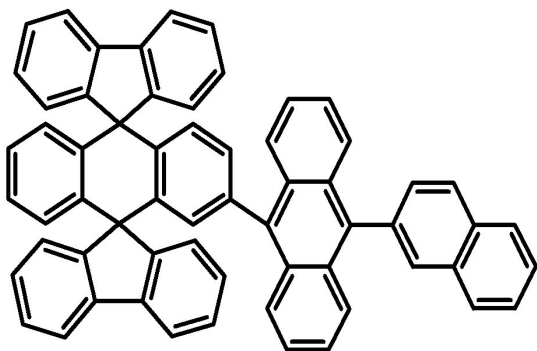
25.

26.

27.

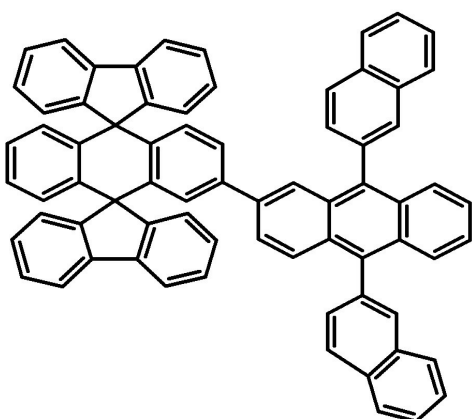
28.

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[15] :
15



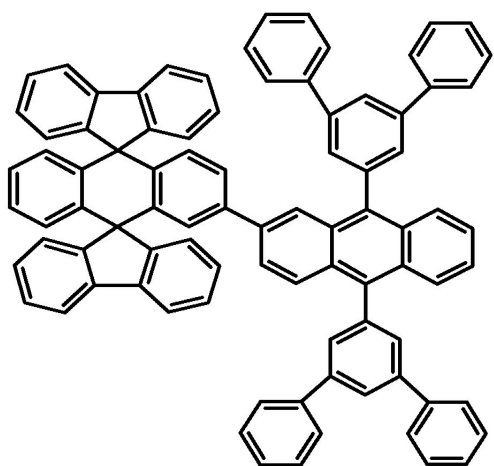
29.

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[16] :
16



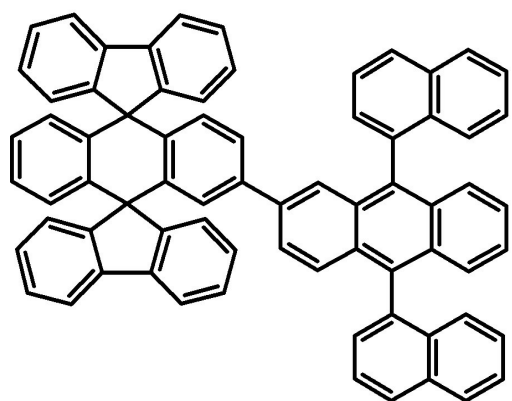
30.

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[17] :
17



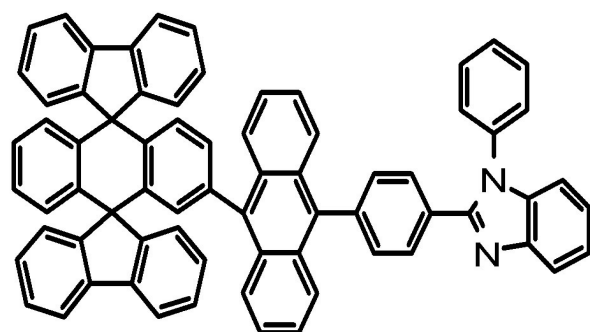
31.

1
[18] 18 :



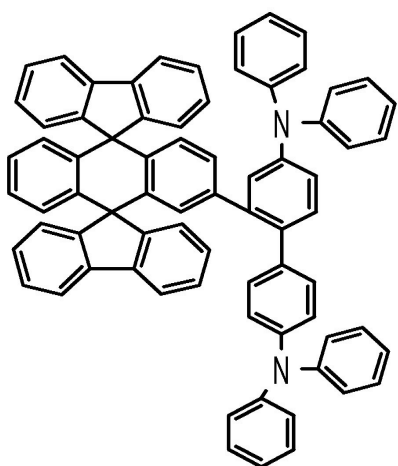
32.

1
[19] 19 :



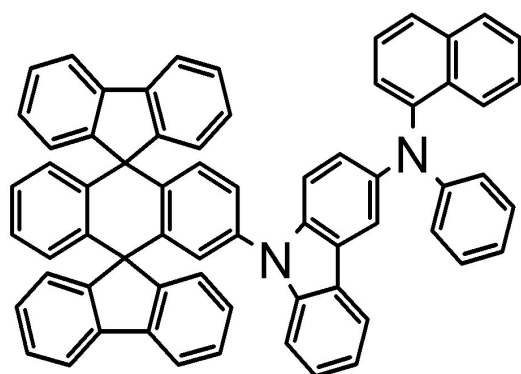
33.

1
[20] 20 :



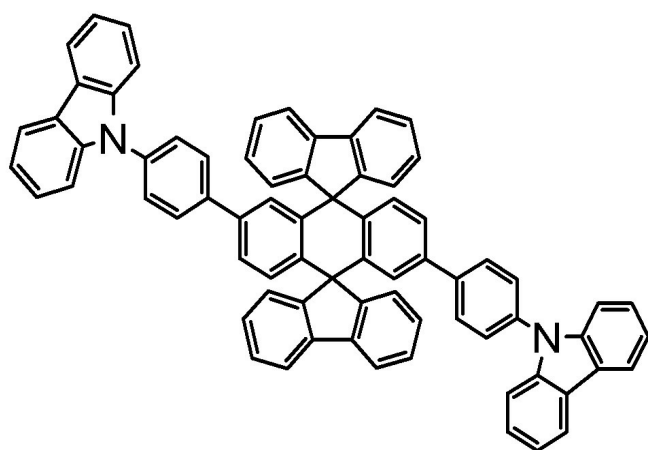
34.

1
[21]²¹ :



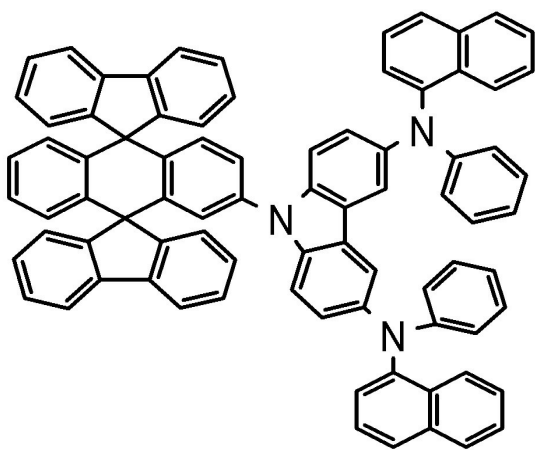
35.

1
[22]²² :



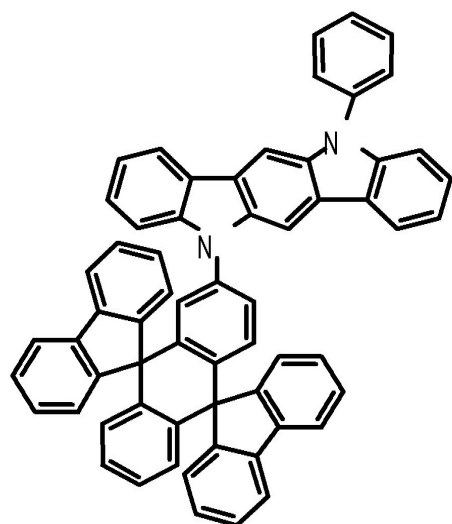
36.

1
[23]²³ :



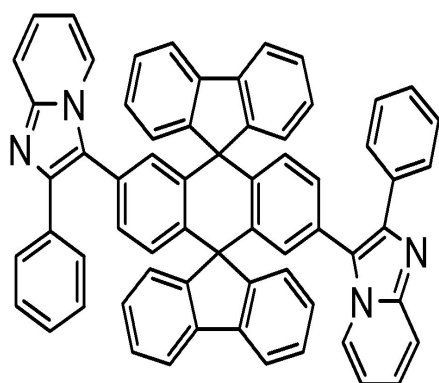
37.

1 ,
[24]

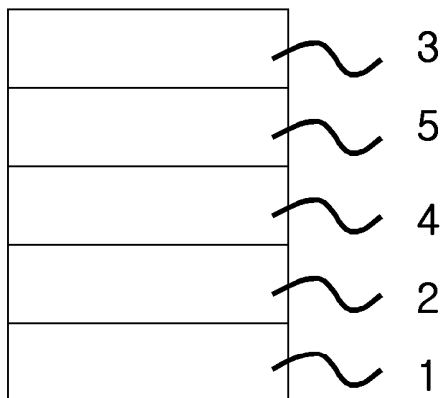


38.

1 ,
[25]



1



2

