

(19)
(12)

(KR)
(A)

(51) 。 Int. Cl. 7
H01L 31/042

(11)
(43)

2003 - 0020854
2003 03 10

(21) 10 - 2002 - 0053257
(22) 2002 09 04

(30) 01121178.6 2001 09 04 EP(EP)

(71) ()
,10785 , 1

(72)
70327 가 - - 1
가
70327 가 - - 1
70327 가 - - 1

(74)
:

(54)

, /

1

, , / , , .

1 , .

2 , TiO₂/ 5nm LiF HTM/ 15nm CsF가
 1 I/V
 3 / , / / ,

(Chapin) 1954 6% p/n 가 가
 30% AlGaAs/GaAs 2 가 , 25
 3 12% 15%
 , WO91/16719 가 (Gretzel)
 , 12% 가 (: O'Reagan, B. et al; Nature(1991), 353, page 737).

· TiO₂
 (Hagen) (Synthetic Metals 89, 1997, 215)
 (HTM) (Bach) (Nature 398, 1998, 583) 0.74%
 TiO₂ HTM TiO₂ 가 , ((4-)
 [N(PhBr)₃SbCl₆] 가

, TiO₂ -
 , (Guo, P.) (: Thin Solid Films 351, 199
 9, 290) TiO₂ Nb₂O₅ ; (Kruger) (
 : Advanced Materials 12, 2000, 447)
 , (Kelly) (: Langmuir 1
 999, 15, 7047) , Li⁺ T
 iO₂ (Hu
 ang) (: J. Phys. Chem. B 1997, 101, 2576)
 TiO₂가

TiO₂

(trop - casting), 가 - (self - assembly)

가 가

가

1 /

가 ,

가

/

/

0.5 30nm,

0.5 15nm .

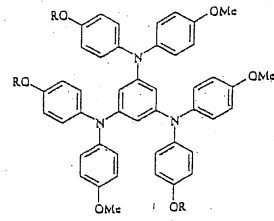
가 .

가 5nm ,

가 15nm .

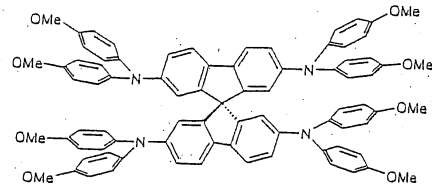
1, 2 3

1



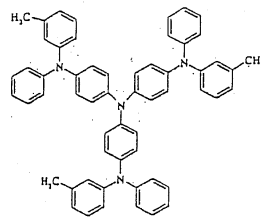
TDAB

2



스피로-MeO-TAD

3



mTDATA

1 ,

: % 가 40: 60 가

, , TiO₂

2 /

(i)

(ii) 가

(iii)

18

EP1 028 475(: 99102473.8 - 2214)

(Shaheen) (: Applied Physics Letters 78 (2001), 841), (Brabec) (: Advanced Functional Materials, 11 (2001), 15) - (Schmidt - Mende) (: Science 294 (2001), 5532)

V_{oc}

FF(fill factor)가

A1

(Hung) (: Applied Physical Letters, 70 (1997), 152)
Applied Physics Letters 79, 2001, 563)
Materials Science and Engineering B85 (2000) 140) (Brown)
77 (2000) 3096)

(Yang) (: Applied Physic
(Ganzorig) (: Mate
(: Applied Physics Letters,

가 가
 TiO_2

가

가

TiO_2/HTM

HTM/Au

EP 0 901 175 A2

가 , WO 98/48433, DE 19704031.4 DE 19735270.7
LED , TDAB , TDAB , , p - , m -
0 - 가 , , , ,

가 가
EP 111 493.3
가 EP 0 887 817 A2
, Ru(II) 가

가 3 , 4 , 5 6
EP 0 333 641 A1

가 , 가 , 가 , 가
:

I. TCO()

II. TCO

- a. 70 15
- b. ,
- c. 70 15
- d. 70 15
- e.

III.

a. TiO₂ ;

b. 500 .

IV. TiO₂

a. : 3 μm , (doctor blading) TiO₂ TiO₂ .

b.

1. 85 30 가 .

2. , 1/2 450 .

3. .

V. TiO₂

a. 가 5 x 10⁻⁴ M .

b. 80 .

c. 8 .

d. , , .

VI. LiF (5nm).

VII. (HTM)

a. HTM " " :
: (+ 10%)

HTM: (5 - 60 mg/)

: HTM(0.2 mol% 가)

: Li((CF₃SO₂)₂N)(9 mol%)

b. .

c.

VIII. CsF (15nm).

IX.

a. (Au)

1 , TiO₂, (HTM), 2 FTO , TiO₂ , (Au) .

F 1 , TiO₂/ 5nm LiF , HTM/ I/V 2 15nm Cs
1

	J _{sc} [mA/cm ²]	V _{oc} [mV]	FF [%]	η [%]
CsF (15nm) / Au	1.25	535	65	0.7
TiO ₂ / LiF (5nm)	1.52	562	43	0.6
TiO ₂ /LiF (5nm) // CsF (15nm) / Au	1.99	476	64	1.0

, LiF CsF 100 mW/cm² 1%
3 , TCO , Al p- n- /

가 가

(57)

1.

/

2.

1 , 가 가 ,

3.

1 2 , / 가 ,
p- , n-

4.

1 3 , 가

5.

1 4 , 가 .
6.

1 5 , ,
가 .
7.

1 6 , /
/ / .
8.

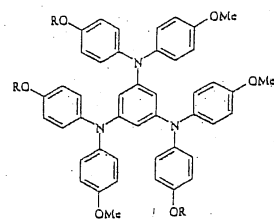
7 , .
9.

1 8 , 가 0.5 30nm, 0.5 15
nm .
10.

1 9 , / 가
11.

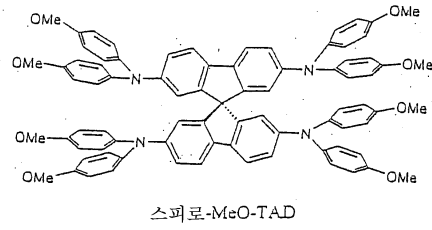
10 , 가 5nm ,
가 15nm .
12.

1 11 , 1, 2 3
1

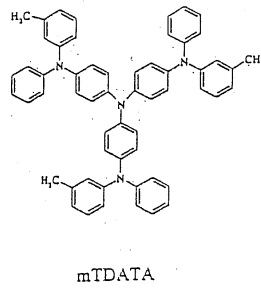


TDAB

2



3



1 ,

: % 가 40: 60 가 .

13.

1 12 , .

14.

13 , , TiO₂ .

15.

, / 1 14 .

16.

15 ,

(i)

(ii) 가 .

17.

15 / 16 , /

18.

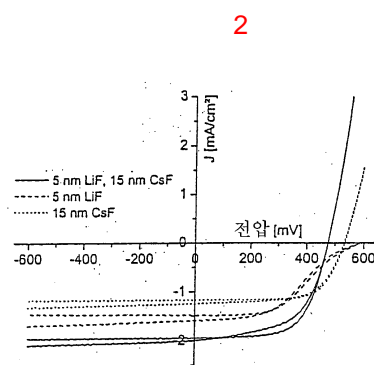
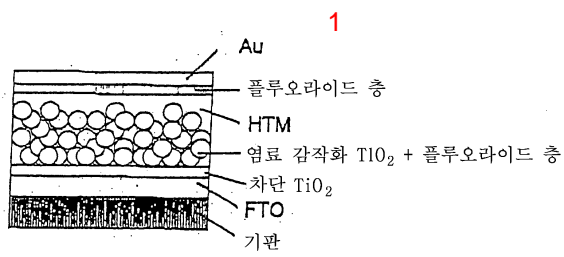
15 17 , , 가 .

19.

1 14 , .

20.

19 , 가 .



3

