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2002 - 0068713  
2002 08 28

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10 - 2001 - 0008955  
2001 02 22

(71) ( )

374 - 2

(72)

8 392 - 27 102

99 101 - 801

3 480 - 236 302

1 65 6 - 304

324 - 10

97 - 3 122 - 104

277 - 55

(74)

:

(54) (10 - ) (2 - - 8 - )

(10 - ) (2 - - 8 - )

1

, , (10 - ) (2 - - 8 - )

1 (OLEDs) ,

2 (10 - ) (BeBq<sub>2</sub>) (2 - - 8 - ) (B  
eMq<sub>2</sub>) (BM ) - 가 ,

3 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM ,

4a 4h N,N' - - N,N' - (3 - ) - 1,1' - - 4,4' - , BeBq , BeMq<sub>2</sub>  
BM AFM(Atomic Force Microscope) ,

5 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM  
,

6 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM OLEDs -  
,

7 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM OLEDs -  
,

8 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM OLEDs  
,

9 BeBq<sub>2</sub> , BeMq<sub>2</sub> BM OLEDs -  
.

< >

11: 12:

13: 14: /

15:

nic Light - Emitting Devices : 가 , (Orga  
OLEDs) .

1987 10 V 가 OLEDs 가 가 . [ Tang, Van Slyke, Appl. Phys. Lett. 51,913 (1987)]. , 1988 (Holmes) (p - ) ( PPV) (Photoluminescence) , PPV 가 , 가 . [J.H. B yrroughes et al., Nature, 347,539 (1990)]. ( ITO) 1992 6 (Nature) PPV [2 - - 5 - (2' - ) - 1,4 - ](MEH - PPV) . , .

OLEDs 가 가 가 가 .

OLEDs 가 , 가 .

OLEDs 가 .

가

OLEDs .

BeBq<sub>2</sub> BeMq<sub>2</sub> OLEDs .

, BeBq<sub>2</sub> BeMq<sub>2</sub> 1:5 5:1 , 3:1 가 가 .

BeBq<sub>2</sub> BeMq<sub>2</sub> .

BeBq<sub>2</sub> BeMq<sub>2</sub> 가 1:5 5:1 , 3:1

B

OLEDs

가

OLEDs

OLEDs

가 BeBq<sub>2</sub> BeMq<sub>2</sub>

"

"

가

/

/

OLEDs , 1

(11)

(12),

(13), /

(14)

,

/

(14)

(15)

(12)

(Au)

(ITO)

(13)

1

N,N' -

- N,N' - (3 -  
C<sub>38</sub> H<sub>32</sub> N<sub>2</sub>

) - 1,1' -

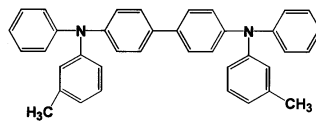
- 4,4' -

( TPD)

. TPD

가

1



(14)

BeBq<sub>2</sub> (

2)

BeMq<sub>2</sub> (

3)

. BeBq<sub>2</sub>BeMq<sub>2</sub>

가

/

(14)

(14)

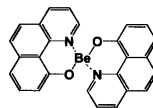
50 nm

200 nm

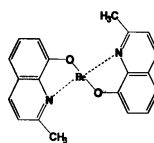
(14)

가

2



3



/ (14) BeBq<sub>2</sub> BeMq<sub>2</sub>  
 1:5 5:1  
 BeBq<sub>2</sub> BeMq<sub>2</sub> 가 3:1 가  
 (15) Al, Ca, Mg, In , Mg/Al  
 가 OLEDs (12)  
 (15) 가 (15) (12) (-)  
 (15) / (14) (12)  
 13) / (14) (14)  
 (exciton) , (14)  
 가 가  
 / (14) BeBq<sub>2</sub> BeMq<sub>2</sub> , BeBq<sub>2</sub> BeMq<sub>2</sub>  
 가 (morphology)가 , OLEDs  
 OLEDs  
 , ITO (11) , ITO (12)  
 , (Organic Molecular Deposition: OMD) TPD  
 (13)  
 OMD , BeBq<sub>2</sub> BeMq<sub>2</sub> BeBq<sub>2</sub> BeMq<sub>2</sub>  
 가 1:5 5:1 / (14) / (14)  
 (13)  
 , (Physical Vapor Deposition: PVD) Al, Ca, Mg, In , Mg/  
 Al (15) OLEDs  
 , 가  
 < 1: >  
 1 - 1.  
 가  
 1  
 , 5  
 , 6  
 , 7

## 기판의 세정 단계

단 계	내 용
1	중류수로 세척한 후 아세톤으로 다시 세정
2	트리클로르에틸렌(Trichloroethylene)에 넣고 초음파 세정(10분)
3	아세톤에 넣은 후 다시 초음파 세정 (10분)
4	중류수에 넣고 초음파 세정 (10분)
5	이소프로필알코올에 넣고 초음파 세정(10분)
6	중류수로 세척
7	에탄올에 넣어 보관

1 - 2.

1 - 2 - 1. TPD

TPD

(TCI) 1

1 - 2 - 2. BeBq<sub>2</sub>BeBq<sub>2</sub>(BeSO<sub>4</sub> · 4H<sub>2</sub>O) 10 -(10 - hydroxy - benzo[h] quinoline)  
TCIBeSO<sub>4</sub> · 4H<sub>2</sub>O 0.45g  
1g50Mℓ 가 1:1 /  
1M20Mℓ 10 -  
pH 105 6  
(stirring)

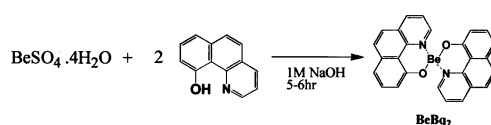
(filtering) 2

(NaHCO<sub>3</sub>) 3 ,

2

1

1

1 - 2 - 3. BeMq<sub>2</sub>BeMq<sub>2</sub>

TCI

(BeSO<sub>4</sub> · 4H<sub>2</sub>O) 2 - - 8

(2 - methyl - 8 - hydroxyquinoline)

BeSO<sub>4</sub> · 4H<sub>2</sub>O 0.5g  
, 1M

50Mℓ

12 - - 8 -

1g 75Mℓ

pH 6

5

- 6

2 ,

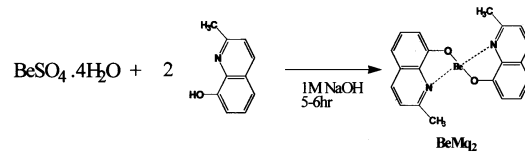
3 ,

-

2

2

2



## 1 - 3. OLEDs

ITO ( BeBq<sub>2</sub> / BeMq<sub>2</sub> BM = 15 / ) TPD , BM

## 1 - 3 - 1. TPD BM /

OMD ITO , OMD (cell) TPD 가 10  
<sup>-6</sup> torr TPD ITO 400 TPD ( 1 12)

BeBq<sub>2</sub> BeMq<sub>2</sub> 가  
 BeBq<sub>2</sub> BeMq<sub>2</sub> 가 1:0, 1:1, 1:3, 1:5, 5:1, 3:1, 0:1 / ( 1 14)  
 600 7 TPD

## 박막 형성 조건

		BeBq <sub>2</sub> ( Å/sec)	BeMq <sub>2</sub> ( Å/sec)	전체증착율 ( Å/sec)	증착속도비
1	BeBq <sub>2</sub>	2.0	0.0	2.0	1 : 0
2	B5M1	1.5	0.3	1.8	5 : 1
3	B3M1	1.5	0.5	2.0	3 : 1
4	B1M1	1.0	1.0	2.0	1 : 1
5	B1M3	0.5	1.5	2.0	1 : 3
6	B1M5	0.3	1.5	1.8	1 : 5
7	BeMq <sub>2</sub>	0.0	2.0	2.0	0 : 1

2 6 BeBq<sub>2</sub> BeMq<sub>2</sub>

BM , 2 BeBq<sub>2</sub> BeMq<sub>2</sub>

## 1 - 3 - 2. Al

Al PVD OLEDs .

Al

1 15) 1 OLEDs .

< 2: - 가 >

1 - 3 - 1 BeBq<sub>2</sub> BeMq<sub>2</sub> BM  
(Hewlett - Packard) 8425A (spectrometer) - 가 .

- 가 2 . BeBq<sub>2</sub> (optical absorption)  
(maximum peak) 420 nm (edge)가 465 n

m BeMq<sub>2</sub> 380 nm ,  
(edge)가 444 nm . BM - 가 BeB

q<sub>2</sub> BeMq<sub>2</sub> 가 (hoping)

2 - 가

. 465 nm 2.67eV , BeBq<sub>2</sub> (Eg) . 3  
- 가 ( edge )

[ 1]

	BeBq <sub>2</sub>	B5M1	B3M1	B1M1	B1M3	B1M5	BeMq <sub>2</sub>	
edge (nm)	465.3	456.5	454.5	454.5	453.9	447.7	444	
E <sub>g</sub> (eV)	2.67	2.72	2.73	2.73	2.73	2.77	2.79	

< 3: >

1 - 3 - 1 BeBq<sub>2</sub> BeMq<sub>2</sub> BM  
(Perkin Elmer) LS50B . (Photoluminescence: PL)

3 .

BeBq<sub>2</sub> BeMq<sub>2</sub> 가 500 nm , BM BeMq<sub>2</sub> 가  
가 , BeBq<sub>2</sub> 가 500 nm 가  
가 BeBq<sub>2</sub>

BeMq<sub>2</sub> 가 BeBq<sub>2</sub> . 4



## 각 박막의 광 발광 특성 곡선의 위치

	BeBq <sub>2</sub>	B5M1	B3M1	B1M1	B1M3	B1M5	BeMq <sub>2</sub>
최대 피크 파장(nm)	500	500	500	500	493	490	500

< 4: >

1 - 3 - 1 OLEDs  
(Ionization Potential: IP)

(Cyclic voltammetry)  
(Electron Affinity: EA)

5

## 각 박막의 이온화 에너지 및 전하 친화도 특성값

	BeBq <sub>2</sub>	B5M1	B3M1	B1M1	B1M3	B1M5	BeMq <sub>2</sub>
$E_{\text{onset}}^{\text{OX}}(\text{V})$	0.9	0.9	0.88	0.9	0.96	0.82	0.83
IP(eV)	5.7	5.7	5.68	5.7	5.76	5.62	5.63
$E_{\text{onset}}^{\text{Red}}(\text{V})$	-1.8	-1.83	-1.84	-1.75	-1.81	-1.9	-1.86
EA(eV)	3.0	2.97	2.96	3.05	2.99	2.9	2.94
$E_g(\text{eV})$	2.7	2.73	2.72	2.65	2.77	2.72	2.69

5 가 - 가 ( 3 ) 가

가 1:1  $E_g$  BeBq<sub>2</sub> BeMq<sub>2</sub> 가 3:1, 1:5, 0:1 가 IP 1:5 0:1 EA PL

3:1 가

< 5: >

1 - 3 - 1 TPD BeBq<sub>2</sub>, BeMq<sub>2</sub> BM AFM(A  
tomic Force Microscope) 2  $\mu\text{m}$   
tact) 4a TPD 3 (con  
0 4b 4h BeBq<sub>2</sub> (roughness)가 2  
BeMq<sub>2</sub> BM ( 4c 4g) 가 BM  
( 4d) (grain) 가 B3M1  
가 (carrier) 가 B3M1 ( 4  
d) , 가 , B3M1 ( 4d) 가 가  
, 가 5 AFM  
, BM BeBq<sub>2</sub> 가  
, B5M1 BeMq<sub>2</sub>

< 6: OLEDs - >

1 - 3 - 2 OLEDs 6 , OLEDs  
(Space Charge Limited Current, SCLC) (Trap  
Charge Limited Current, TCLC) .

(threshold voltage) B3M1 3.5 V , B5M1 4 V  
7 V . B3M1 , 3.5 V가 가 가  
(luminance)가 가 . B3M1 가 가 가  
가 .

< 7: OLEDs - >

1 - 3 - 2 OLEDs 가 7 .  
가 , 가 B3M1 B5M1  
가 . BeMq<sub>2</sub>  
가 가 BeMq<sub>2</sub>  
가 가 (quenching site) (quenching)

BeBq<sub>2</sub> B3M1 19 V 3000 cd/m<sup>2</sup> , BeBq<sub>2</sub> BeMq<sub>2</sub> 가 3:1  
가 17 V 6000 cd/m<sup>2</sup> 2 가

< 8: OLEDs (Electroluminescence, EL) >

1 - 3 - 2 7가 OLEDs 가 8 .  
(EL) (PL)

B3M1 , 가 가 10 nm ,  
5 nm . PL EL BeBq<sub>2</sub> BeMq<sub>2</sub> BeBq<sub>2</sub> BeMq<sub>2</sub>

< 9: OLEDs (Luminous efficiency) - (J) >

(Luminance efficiency; lm/w) 1 .

1

$$\eta_{lm/w} = \frac{\pi \cdot L}{J \cdot V}$$

L sr · cd/m<sup>2</sup>, J A/m<sup>2</sup>, V .

B5M1 가 가 n J<sup>-1/n</sup>  
B3M1 가 9 , BM B3M1 / 가 ,  
가

BeBq<sub>2</sub> BeMq<sub>2</sub> OLEDs 가 , 가  
BeBq<sub>2</sub> BeMq<sub>2</sub> 가 가 가 가 가 가 가 가

, BeBq<sub>2</sub> BeMq<sub>2</sub> 가 3:1 3.5 V(at 1 cd/m<sup>2</sup>) , 17 V 가  
5,990 cd/m<sup>2</sup> 541 mA/cm<sup>2</sup>

(57)

1.

,  
(10 - ) (2 - - 8 - )

2.

1 , (10 - ) (2 - - 8 - )  
가 1:5 5:1 .

3.

2 , 3:1 .

4.

1 , .

5.

4 , ,

6.

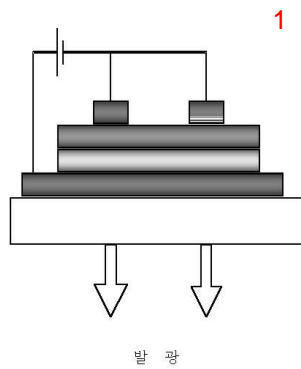
(10 - ) (2 - - 8 - )

7.

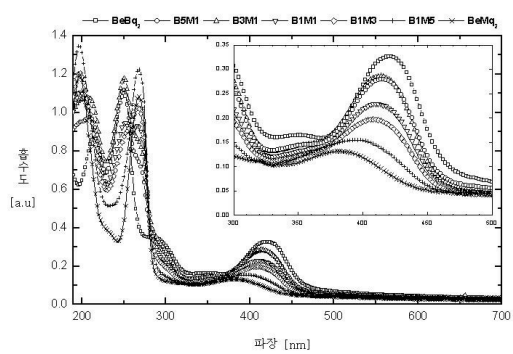
6 , (10 - ) (2 - - 8 - )  
가 1:5 5:1 (10 - ( ) (2 - - 8 - )

8.

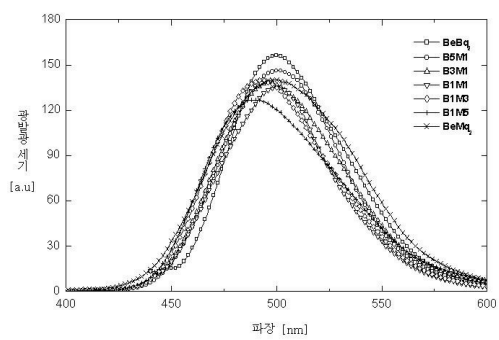
7 , 가 3:1



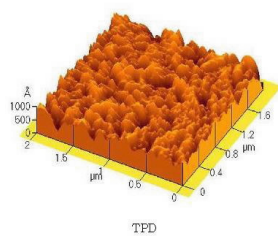
2



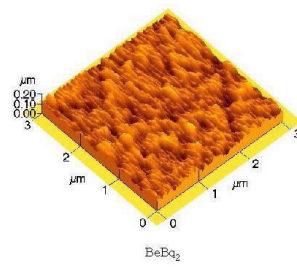
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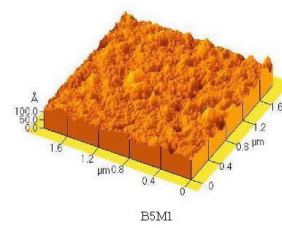
4a



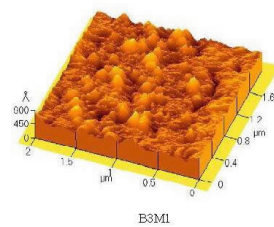
4b



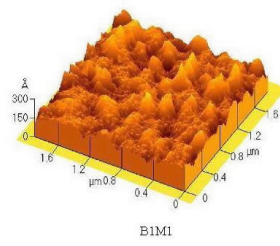
4c



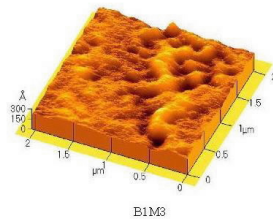
4d



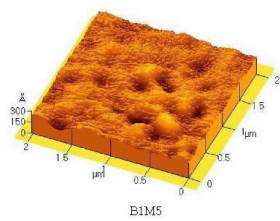
4e



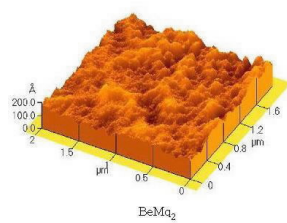
4f



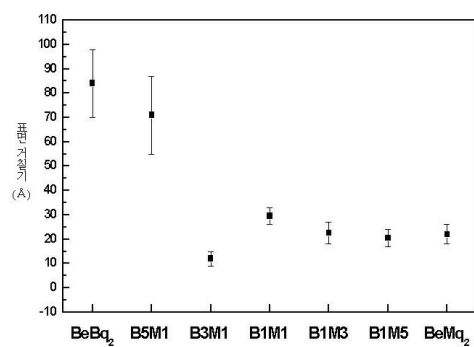
4g



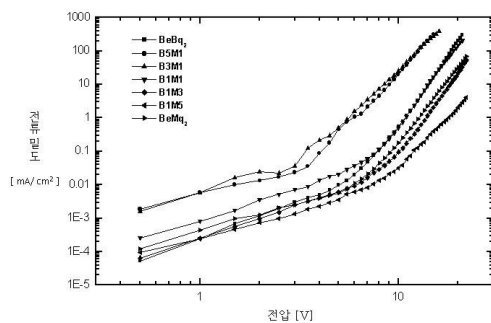
4h



5

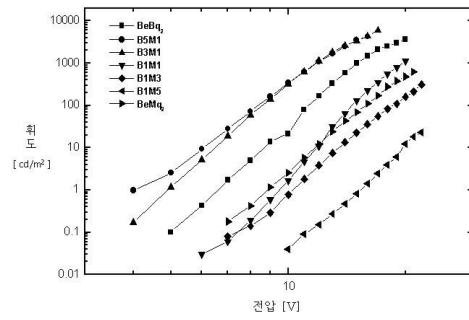


6

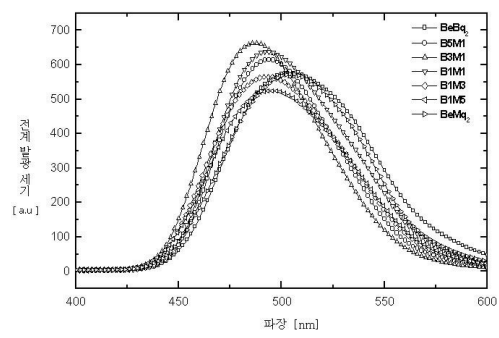




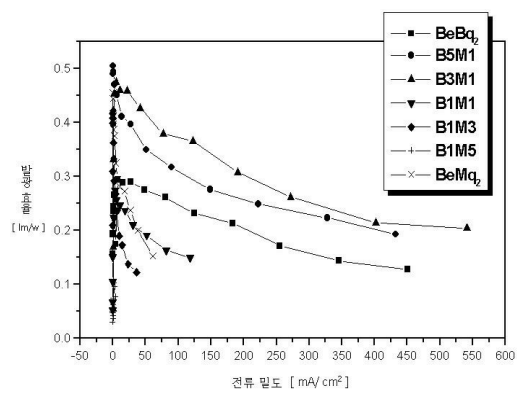
7



8



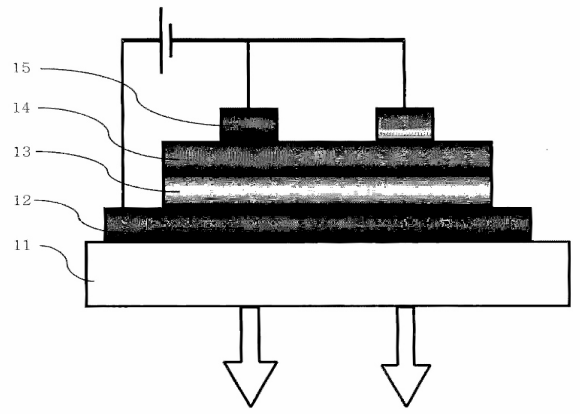
9



专利名称(译)	双 ( 10-羟基苯并喹啉 ) 铍和双 ( 2-甲基-8-羟基喹啉 ) 的混合物		
公开(公告)号	<a href="#">KR1020020068713A</a>	公开(公告)日	2002-08-28
申请号	KR1020010008955	申请日	2001-02-22
申请(专利权)人(译)	宇预支給显示器材料有限公司		
当前申请(专利权)人(译)	宇预支給显示器材料有限公司		
[标]发明人	KIM SUNG MIN 김성민 KIM BONG OK 김봉옥 PARK NO GILL 박노길 KWAK MI YOUNG 광미영 SHIM JAE HOON 심재훈 KIM YOUNG KWAN 김영관 HA YUN KYOUNG 하윤경		
发明人	김성민 김봉옥 박노길 광미영 심재훈 김영관 하윤경		
IPC分类号	C09K11/06		
CPC分类号	C09K11/06 C09K2211/186 H01L51/0077 H01L51/5012 H05B33/14 Y10S428/917		
代理人(译)	PARK , IL YOUNG		
其他公开文献	KR100406463B1		
外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

本发明涉及有机发光器件，其中双 ( 2-甲基-8-羟基苯并喹啉合 ) 铍和双 ( 10-羟基苯并喹啉 ) 铍的混合物用作电致发光材料。对于配备有由该混合物组成的发光层的有机发光装置，发光效率优异。有机发光器件，发光层和双 ( 2-甲基-8-羟基苯并喹啉合 ) 铍和双 ( 10-羟基苯并喹啉 ) 铍的混合物。



발 광