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(11)
(24)

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2004 06 07

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(22) 2000 02 17

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(43)

10-2000-0058080
2000 09 25

(30) 11-41888 1999 02 19 (JP)

(73) 가 가 가 2 26 10

(72) 가 가 2 26 10 가 가

(74)

:

(54)

ZnO ; ZnO ; ZnO .

1

1
2 ZnO
3 ZnO
4
5 4
()

- 1:
- 2: c
- 3: ZnO
- 4: ZnO

(勵起子; exciton) 가 , ZnO

, GaN 가 , ZnO

, ZnO , GaN

, 370nm , ZnO , ZnO

ZnO (, ZnO) , 가 , ZnO Zn

O , ZnO , ZnO

, ZnO 가 , ZnO

E , 가 , ZnO MBE(Molecular Beam Epitaxy) 가 , MB

, ZnO ZnO 가

ZnO ; ZnO ; ZnO

, Li, Cu, Ni, Y, Ag, Mn, Mg, Al, V, Fe, La, Ti, Ta, Nb Ga / ZnO

, 가 , 가

() ZnO , ZnO ZnO

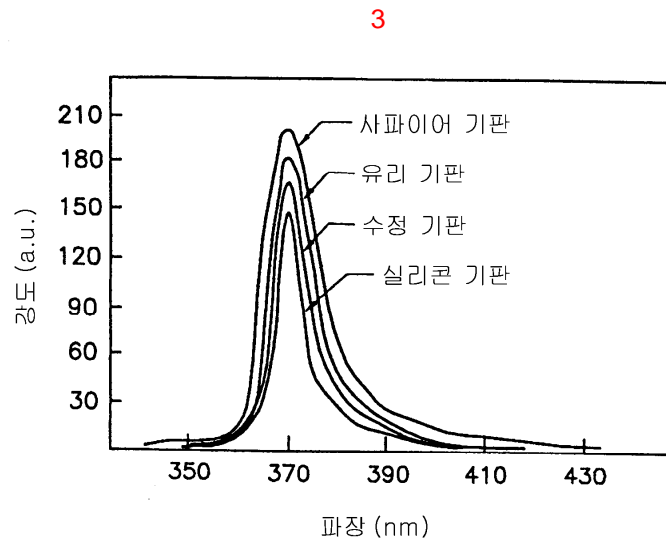
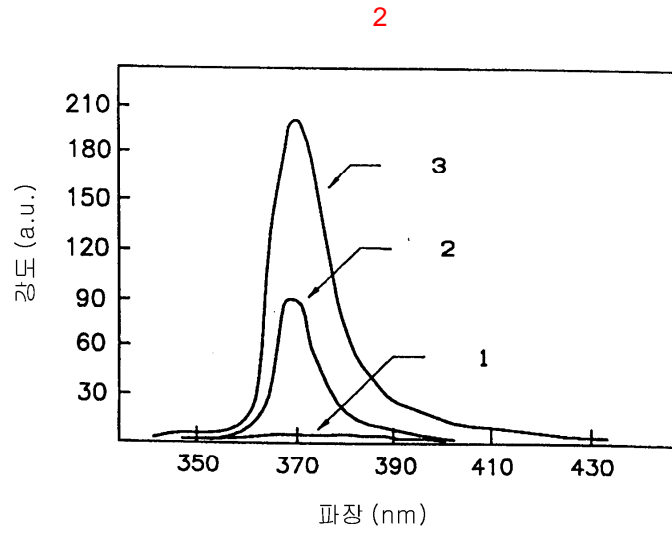
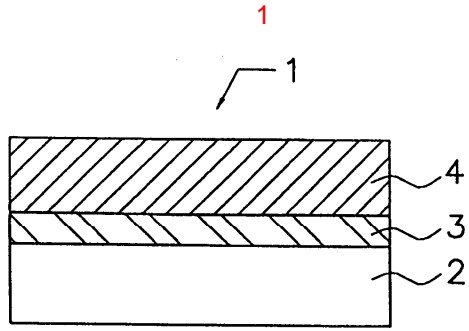
E 2 3 , ZnO , 2 MB
6 , 3 ZnO / , 3
, c , Z ZnO , n
가 He-Cd ,
, Z 3 3 , 가
, n , ZnO ZnO
, / ZnO ZnO , 99.99%
2 , 99.99% 가 (11) , ZnO ,
(11) 가 LED ,
, c 4 (12) , Al ZnO (13) , Al
, ZnO (13) n ZnO , ZnO (13) ZnO (14)
N() p ZnO (15) . ZnO (13, 14, 15)
p ZnO (15) ZnO (14) ZnO
(13) . p ZnO (15) , 가 ZnO (16) (16) Ti/Au ZnO
p-n (11) , (16) (17) (17) 가
2 , , ZnO (13) 2 5 ,
) c (21) c (12) ZnO (14) ZnO (23) ZnO (23)
. 1 (23b) ZnO 1 (23b) ZnO (14) 가 ZnO (23a)
Li, Cu, Ni, Y, Ag, Mn, Mg, Fe, La, Ti, Ta, Nb Ga
(23a) ZnO 가 ZnO , 2
Al V , ZnO (23) ZnO (14) 가 , 2
(23a) ZnO (14) 가 .

가 / ZnO , ,
가 .

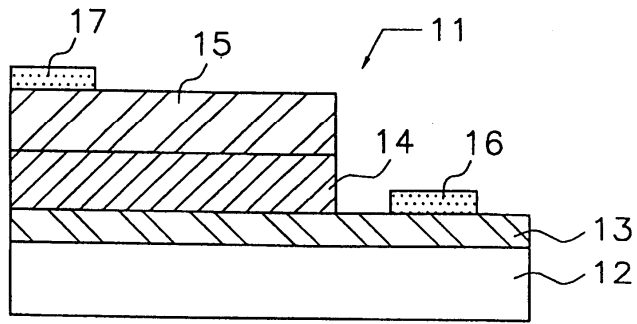
(57)

1. ;
ZnO ZnO ; ZnO ;
2. ;
3. ;
Li, Cu, Ni, Y, Ag, Mn, Mg, Al, V, Fe, La, Ti, Ta, Nb Ga
4. ;

- ZnO ;
 ZnO , 2 ZnO ; 1 ZnO ;
 ZnO , 1 2 ZnO ;
5.
 4 , , ,
6.
 4 , 1 n , 2 p
7.
 4 , 1 ZnO 1 ZnO 2
8.
 7 , 1 Al V , 1 Li, Cu, Ni,
 Y, Ag, Mn, Mg, Fe, La, Ti, Ta, Nb Ga
9.
 7 , 1 Ni가
10.
 ZnO ZnO ZnO ;
11.
 10 , , ,
12.
 10 , Li, Cu, Ni, Y, Ag, Mn, Mg, Al, V, Fe, La, Ti, Ta, Nb Ga
13.
 10 , ZnO
14.
 , 1 1 ZnO ;
 1 ZnO ZnO 2 2 ZnO ;
15.
 14 , , ,
16.
 14 , 1 n , 2 p
17.
 14 , 1 ZnO , ZnO 2 ZnO



4



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