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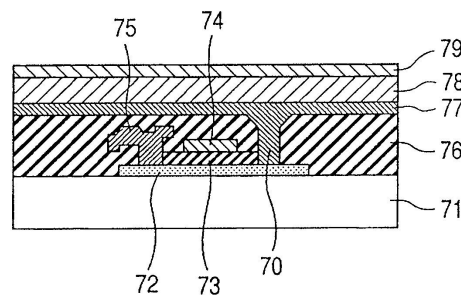
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1 2 (77, 79) (78), (72)

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(72)

2-12-1

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1

1 2

1 2

,

,

$$10^{12}/\text{cm}^3 \quad 10^{18}/\text{cm}^3$$

,

,

,

,

10

,

, X

(halo)

, In, Zn

Sn; In

Zn; In

Sn; In; In, Zn Ga

5

,

.

$$(V_{DS}) \cdot (I_{DS})$$

/

,

L,

W

, $V_{GS} = 0$ [V]

,

 I_{DS}

$$(W/L) \times V_{DS} \times (1.0 \times 10^{-5} /$$

24) [A]

.

2

1

,

,

.

$$(V_{DS}) \cdot (I_{DS})$$

/

,

L,

W

, $V_{GS} = 0$ [V]

,

 I_{DS}

$$(W/L) \times V_{DS} \times (5.0 \times 10^{-8} /$$

24) [A]

.

3

1 2

1 2

,

,

$$10^{12}/\text{cm}^3 \quad 10^{18}/\text{cm}^3$$

,

,

,

,

10

,

, X

(halo)

, In, Zn

Sn; In

Zn; In

Sn; In; In, Zn Ga

5

,

.

$$(V_{DS}) \cdot (I_{DS})$$

/

,

L,

W

, $V_{GS} = 0$ [V]

,

 I_{DS}

$$(W/L) \times V_{DS} \times (1.0 \times 10^{-5} /$$

24) [A]

.

4

3

,

,
 .
 $(V_{DS}) \cdot (I_{DS}) /$
 ,
 $I_{DS} (W/L) \times V_{DS} \times (5.0 \times 10^{-8} /$
 24) [A]
 .

5

1 2

1 2

,
 ,

 $10^{12}/\text{cm}^3 \quad 10^{18}/\text{cm}^3$

10

, X
 , In, Zn Sn; In Zn; In Sn; In; In, Zn Ga 5
 ,

.
 $(V_{DS}) \cdot (I_{DS}) /$
 ,
 $I_{DS} (W/L) \times V_{DS} \times (1.0 \times 10^{-5} /$
 24) [A]
 .

6

5

.
 $(V_{DS}) \cdot (I_{DS}) /$
 ,
 $I_{DS} (W/L) \times V_{DS} \times (5.0 \times 10^{-8} /$
 24) [A]
 .

7

1 2

1 2

, 2

,
 ,

 $10^{12}/\text{cm}^3 \quad 10^{18}/\text{cm}^3$

10

, X (halo)
 , In, Zn Sn; In Zn; In Sn; In; In, Zn Ga 5
 ,
 . (V_{DS}) · (I_{DS}) /
 , L, W , V_{GS} 0 [V] , I_{DS} (W/L) × V_{DS} × (1.0 × 10⁻⁵ /
 24) [A] .

8

7

,
 . (V_{DS}) · (I_{DS}) /
 , L, W , V_{GS} 0 [V] , I_{DS} (W/L) × V_{DS} × (5.0 × 10⁻⁸ /
 24) [A] .

9

1 2

1 2

, 10¹²/cm³ 10¹⁸/cm³

10

, X (halo)
 , In, Zn Sn; In Zn; In Sn; In; In, Zn Ga 5
 ,
 . (V_{DS}) · (I_{DS}) /
 , L, W , V_{GS} 0 [V] , I_{DS} (W/L) × V_{DS} × (1.0 × 10⁻⁵ /
 24) [A] .

10

9

,
 . (V_{DS}) · (I_{DS}) /
 , L, W , V_{GS} 0 [V] , I_{DS} (W/L) × V_{DS} × (5.0 × 10⁻⁸ /
 24) [A] .

11

1 , 3 5



[0001] , , EL EL .

[0002] , (EL) , (FPD) . FPD , (TFT) .

[0003] , FPD , , , , , , , , .

[0004] TFT , (ZnO 2003-298062) .

[0005] , TFT , TFT .

[0006] , , .

[0007] , 1 2 1 2 , , $10^{12}/\text{cm}^3$ $10^{18}/\text{cm}^3$, 10^{10} , In, Zn Sn; In Zn; In Sn; In; In, Zn Ga

5 , (V_{DS}) .

$$(I_{DS}) \quad (W) / \quad (L) \quad V_{DS} \times I_{DS} / (W/L) \leq 1.5 \times 10^{-5} (V \times A)$$

[0008]

[0009]

[0010]

[0011]

[0012]

[0013]

1 2 1 2
 $10^{12}/\text{cm}^3$ $10^{18}/\text{cm}^3$
 10
 Sn; In; In, Zn Ga 5
 (V_{DS}) . (I_{DS}) (W) / (L) V_{DS} ×
 $I_{DS} / (W/L) \leq 1.5 \times 10^{-5} (V \times A)$

[0014]

1 2 1 2
 $10^{12}/\text{cm}^3$ $10^{18}/\text{cm}^3$
 10
 Zn Sn; In Zn; In Sn; In; In, Zn Ga 5
 (V_{DS}) . (I_{DS}) (W) /
 (L) V_{DS} × I_{DS} / (W/L) ≤ 1.5 × 10⁻⁵ (V × A)

[0015]

1 2 1 2
 $10^{12}/\text{cm}^3$ $10^{18}/\text{cm}^3$
 10
 In; In, Zn Ga 5
 (V_{DS}) . (I_{DS}) (W) / (L) V_{DS} × I_{DS} / (W/L) ≤
 1.5 × 10⁻⁵ (V × A)

[0016]

, 1 2 1 2

, $10^{12}/\text{cm}^3$ $10^{18}/\text{cm}^3$

10

Zn; In Sn; In; In, Zn Ga 5

$(V_{DS}) \cdot (I_{DS}) (W) / (L) V_{DS} \times$

$I_{DS}/(W/L) \leq 1.5 \times 10^{-5} (V \times A)$

[0017]

$(V_{DS}) \cdot (I_{DS}) (W) / (L) V_{DS} \times I_{DS}/(W/L) \leq 7.5 \times 10^{-8} (V \times A)$

[0018]

ZnO

ZnO

ZnO

TFT

TFT

ZnO

[0019]

2000-044236

$\text{Zn}_x\text{M}_y\text{In}_z\text{O}_{(x+3y/2+3z/2)}$ (, M Al Ga)

$1 \times 10^{18}/\text{cm}^3$

$1 \times 10^{18}/\text{cm}^3$ TFT

TFT

[0020]

$1 \times 10^{18}/\text{cm}^3$

[0021]

$\text{InGaO}_3(\text{ZnO})_m$

$1 \times 10^{18}/\text{cm}^3$

[0022]

$1 \times 10^{18}/\text{cm}^3$

TFT

TFT

[0023]

[0024]

[0025]

()

- [0026] , 1 7 .
- [0027] , 70 , 71 , 72 , 73
 , 74 , 75 , 77 2 , 78
 , 79 1 . 1 , 2 (, " ")
 , EL , 1 (, " ")
 . , (76) .
- [0028] , .
- [0029] (1.)
- [0030] . , TFT
 , .
 , Si .
- [0031] (2.)
- [0032] , , $1 \times 10^{18}/\text{cm}^3$,
 $1\text{cm}^2/(\text{ . })$. , In-Ga-Zn-0
 . , , , ,
 , In-Ga-Zn-0 50% , 80%
 . , Mg . In-Ga-Zn-0 TFT
 , TFT EL .
- [0033] , .
- [0034] ,
 . ,
- [0035] Al_2O_3 , Y_2O_3 , HfO_2 , 2
 , .
- [0036] ITO , Au .
 , , ,
 2 .
- [0037] (3.)
- [0038] TFT , EL .
 EL (78) , , ,
 . , " " .
- [0039] / +
- [0040] / /
- [0041] / / /
- [0042] / / / /
- [0043] .
- [0044] , ,
 . .
 . ,

- [0045] (Anthracene),
- [0046] (Lewis)
- [0047] 7 EL EL
- [0048] (4. 1)
- [0049] 1
- [0050] IT0, Zn0, In-Zn-0, $1 \times 10^{18}/\text{cm}^3$
In-Ga-Zn-0 nm
- [0051] Pt Ag Mg, Li Al, (Boride), Au
- [0052] (5. 2)
- [0053] 2 2
- [0054] 2
- [0055] EL
- [0056] Ag Mg, Li Al, TFT
- [0057] IT0, Zn0, In-Zn-0, Pt
 $1 \times 10^{18}/\text{cm}^3$ In-Ga-Zn-0 TFT
 $1 \times 10^{19}/\text{cm}^3$
ITO In-Ga-Zn-0 ()
ITO, In-Ga-Zn-0 (), Au
- [0058] IT0, Al Ga Zn0, $1 \times 10^{18}/\text{cm}^3$ In-Ga-Zn-0
In-Ga-Zn-0 In-Ga-Zn-0
- [0059] (6.)
- [0060] 2 (77) (76)

- [0061] (7.)
- [0062] , Al Cr, W , WSi
- [0063] ,
- [0064] , 1 , 7 ,
- [0065] (1)
- [0066] (75) (70) , (72) , (72) ,
(73) (74) .
- [0067] EL (78) , (77) (70) .
(77) TFT (76) , (76)
- [0068] EL (78) (79) , TFT ON EL (78)
- [0069] , (70) , 2 , 2 .
- [0070] 7 , TFT EL (78) ,
, TFT , EL (78) 7
, EL (78)
- [0071] 7 , (70) (77) , (7
5) (77) , (78) (77)
, , TFT
- [0072] ()
- [0073] , EL
- [0074] ()
- [0075] ,
- [0076] $1 \times 10^{18} / \text{cm}^3$,
In-Ga-Zn-O 120nm , $\text{InGaO}_3(\text{ZnO})_4$
- [0077] , 1Pa ,
 $\text{InGaO}_3(\text{ZnO})_4$ 30nm , Au
50nm ,
- [0078] Y_2O_3 , Au 90nm 50nm

- [0079] ()
- [0080] , ITO 300nm ,
- [0081] (EL)
- [0082] , 4, 4'- [N, N-]-4"- -
60nm , 4, 4'- [N-(1-)-N-] 20nm
(tris)(8-
, 4, 4'- (2, 2-) 40nm ,
) 20nm , EL .
- [0083] ()
- [0084] , 2 Al Ag 50nm, Al 50nm
- [0085] , ,
- [0086] , In-Ga-Zn-O
- [0087] , () ,
() .
- [0088] , 25 , 250 , 100 200 0 300 ,
, 25 , 250 , 100 200 .
- [0089] , ,
($1 \times 10^{18} / \text{cm}^3$) , ,
, .
- [0090] , ,
, $1 \times 10^{14} / \text{cm}^3$.
- [0091] , 9 ,
2 .
- [0092] (2)
- [0093] 9 , 91 , 92 ,
93 , 94 , 95 , 96 ,
97 . (97) , ,
, 98 EL , 99 .
- [0094] , , 1
, , (91) ,
, .
- [0095] , , EL
- [0096] $1 \times 10^{18} / \text{cm}^3$
In-Ga-Zn-O , ,

- [0097] 9 TFT , 1 ,
1 2 , 1
2 ,
EL , EL ,
- [0098] , 1 2 ,
TFT , TFT In, Ga Zn ,
TFT .
- [0099] , ,
- [0100] .
- [0101] , 3 8 .
- [0102] 9 , (97) , ,
(95) . , ,
 , .
- [0103] (3)
- [0104] 8 , 81 EL (84) , EL (84) EL
(84) . 82
(2) , (81) .
- [0105] , (83) , , (87) 2
 , 1 .
(85) (86) .
- [0106] , .
- [0107] () (85)
 , () (86)
(82) .
- [0108] , 82 ON (86) 82
(83) . 81
 , 81 .
 (81) , EL (84)
 .
- [0109] 8 , 1 2 , 1 .
- [0110] , In-Ga-Zn-0
TFT , TFT
 , TFT
 .
- [0111] (4)
- [0112] 4 , 11 12 .
- [0113] , , , , ,

- [0114] , (2350) , 13 (2350) , (2300) , ()
- [0115] , 1 2 ,
- [0116] ()
- [0117] , 1-3 .
- [0118] , 25 , 0 40 , 0 40 , $10^{18}/\text{cm}^3$, 25 , $10^{18}/\text{cm}^3$, $1 \times 10^{17}/\text{cm}^3$, $1 \times 10^{16}/\text{cm}^3$, TFT
- [0119] , " $10^{18}/\text{cm}^3$ " " , " $1 \times 10^{18}/\text{cm}^3$ " $1.0 \times 10^{18}/\text{cm}^3$ "
- [0120] , , X , (halo) ,
- [0121] , TFT , $1 \times 10^{12}/\text{cm}^3$.
- [0122] , , $1 \times 10^{12}/\text{cm}^3$ $1 \times 10^{18}/\text{cm}^3$, $1 \times 10^{13}/\text{cm}^3$ $1 \times 10^{17}/\text{cm}^3$, $1 \times 10^{15}/\text{cm}^3$ $1 \times 10^{16}/\text{cm}^3$. , InZnGa , In , $\text{In}_x\text{Zn}_{1-x}$ ($0.2 \leq x \leq 1$) , $\text{In}_x\text{Sn}_{1-x}$ ($0.8 \leq x \leq 1$) , $\text{In}_x(\text{Zn}, \text{Sn})_{1-x}$ ($0.15 \leq x \leq 1$) . , $\text{In}_x(\text{Zn}, \text{Sn})_{1-x}$, $\text{In}_x(\text{Zn}_y\text{Sn}_{1-y})_{1-x}$ ($0 \leq y \leq 1$) .
- [0123] , Zn Sn In , In Ga: $\text{In}_x\text{Ga}_{1-x}$ ($0 \leq x \leq 1$) .
- [0124] , $1 \times 10^{18}/\text{cm}^3$.
- [0125] , $\text{InGaO}_3(\text{ZnO})_m$ (m: 6) , $1 \times 10^{18}/\text{cm}^3$ In-Ga-Zn-O .
- [0126] , $\text{InGaO}_3(\text{Zn}_{1-x}\text{Mg}_x\text{O})_m$ (m: 6 , $0 < x \leq 1$) , $1 \times 10^{18}/\text{cm}^3$ In-Ga-Zn-Mg-O .
- [0127] , $1\text{cm}^2/\text{sec}$

[illegible]

- [0143] 14 , 701 RP(), 702 TMP(), 703 , 704
RHEED , 705 , 706 , 707
, 708 , 709 , 710 , 711
, 712 , 713 , 714 TMP(), 715 RP(), 716
, 717 , 718 IG(), 719 PG((Pirani)), 720 BG(
) , 721 .
- [0144] KrF , SiO₂ (1737) In-Ga-Zn-
0
, , , 5 , 100 .
, , , 5 , 100 .
- [0145] , InGaO₃(ZnO)₄ (: 20mm, 5mm) , ,
, In₂O₃, Ga₂O₃, ZnO(4N) (:), (1000 , 2),
(1550 , 2) . , 90S/cm .
- [0146] 2×10^{-6} Pa , 6.5Pa .
(721) 6.5Pa, 25 , 708 (707) ,
30mm , (716) , 1.5-3mJ/cm²/pulse) . , 20nsec,
10Hz, , 1 × 1mm . , 7nm/min
.
- [0147] , X (SAXS)(, : 0.5 °) ,
In-Ga-Zn-0 . X
, (Rrms) 0.5nm , 120nm . X
(RF) , In:Ga:Zn=0.98:1.02:4 . , 1×10^{-2} S/cm
.
 1×10^{-16} /cm³ , 5cm²/V · sec .
, , 3eV .
- [0148] , In-Ga-Zn-0 , InGaO₃(ZnO)₄
, , .
- [0149] , 1 . 1 ,
InGaO₃(ZnO)_m(m: 6)
.
- [0150] 4.5Pa , , 1
 1×10^{18} /cm³ . ,
, 100 .
, , 100 .
- [0151] , 1
, 25 , 5Pa InGaO₃(ZnO)₄ , 1×10^{16} /cm³
.
- [0152] , 2 , 1cm²/ · sec . ,
, 6.5Pa , , TFT
.
- [0153] , , 4.5Pa , 5Pa , 6.5Pa
, InGaO₃(ZnO)_m(m 6)
.

[0154] , , $1\text{cm}^2/\text{V}\cdot\text{sec}$, - 1×10^3

[0155] , PLD InGaZn ,
4.5Pa 6.5Pa .

[0156] , $1\times 10^{18}/\text{cm}^3$, , ,

[0157] , 6.5Pa , 5
MISFET . (1) In-Ga-Zn-O
(2) 120nm $\text{InGaO}_3(\text{ZnO})_4$,
1Pa , $\text{InGaO}_3(\text{ZnO})_4$ 30nm
 , (5) (6)
 , (3) Y_2O_3 (:90nm, : 15,
 :0.5MV/cm $1\times 10^{-3}\text{A}/\text{cm}^3$) ,
(4) .

[0158] MISFET

[0159] 6 , MISFET - . V_{DS} ,
 I_{DS} n . In-Ga-Zn-O n
. $I_{\text{DS}} V_{\text{DS}}=6\text{V}$ ()
 , $V_{\text{DS}}=4\text{V}$ $V_{\text{GS}} -0.5\text{V}$.
 , $V_{\text{G}}=10\text{V}$, $I_{\text{DS}}=1.0\times 10^{-5}\text{A}$. In-Ga-Zn-O
.

[0160] - , 1×10^3 . ,
 , $7\text{cm}^2(\text{Vs})^{-1}$.

[0161] , , , ,

[0162] , , , ,
 , .
 , , TFT .

[0163] (2 : (SP))

[0164] , SP , .

[0165] SP , 15 . 15 , 807 , 808
 , 805 , 814 , 815 , 817 , 818
 , 819 , 821 , 830 .

[0166] (807) , SiO_2 (1737) ,
 , 5 , 100 .

[0167] , $\text{InGaO}_3(\text{ZnO})_4$ (: 20nm, 5mm)
 , , $\text{In}_2\text{O}_3, \text{Ga}_2\text{O}_3, \text{ZnO}$ (4N) (:), (1000 , 2
) , , (1550 , 2) . (808) 90S/cm

- [0168] (821) , 1×10^{-4} Torr . ,
 $4 \times 10^{-1} \times 10^{-1}$ Pa . ,
 $1 \times 10^{-3} \times 2 \times 10^{-1}$ Pa .
- [0169] , , . (808) (807) , 30mm .
- [0170] , RF 180W , , 10nm/min .
- [0171] , X (SAXS) (: 0.5°) ,
 In-Ga-Zn-0 . X
 (Rrms) 0.5nm , 120nm . X
 (RF) , In:Ga:Zn=0.98:1.02:4 .
- [0172] ,
 3 .
- [0173] 3 , 3×10^{-2} Pa , ,
 10^{-10} S/cm . ,
- [0174] , 3 , 25 , 1×10^{-1} Pa InGaO₃(ZnO)₄ ,
 1×10^{-10} S/cm . , 1×10^{-1} Pa InGaO₃(ZnO)₄ ,
 , , $1 \text{ cm}^2 / \text{V} \cdot \text{sec}$
 .
- [0175] , 3×10^{-2} Pa , 5×10^{-1} Pa ,
 In-Ga-Zn-0 , InGaO₃(ZnO)_m (m = 6)
 , ,
 - 1×10^3 .
- [0176] ,
 , 3×10^{-2} Pa , 5×10^{-1} Pa . ,
 , 2 , , .
- [0177] , , , , ,
 . , , , , ,
 , .
- [0178] , 200um (PET) ,
 InGaO₃(ZnO)₄ .
- [0179] , InGaO₃(Zn_{1-x}Mg_xO)_m (m: 6 , $0 < x \leq 1$) , 1Pa
 , InGaO₃(Zn_{1-x}Mg_xO)_m . , Zn 80atom% Mg
 , 0.8Pa , 1×10^{-2} S/cm .) . Mg
 $10^{16} / \text{cm}^3$ (, 1×10^{-2} S/cm .) . Mg
 , , $5 \text{ cm}^2 / \text{V} \cdot \text{sec}$,
 , 1 , Mg ,
 , Mg , 20% 85% ($0.2 < x < 0.85$) .

[0180] , Al_2O_3 , Y_2O_3 , HfO_2 , .

[0181] , .
. Al_2O_3 , Y_2O_3
, HfO_2 ,
, TFT
, TFT ,

[0182] TFT , 3 . TFT ,

[0183] , .

[0184] ,
() .

[0185] , 0 ~300 ,
, 25 ~ 250 , 100 ~200 .

[0186] ,
, $(1 \times 10^{18} / \text{cm}^3)$,
, .

[0187] ,
, $1 \times 10^{14} / \text{cm}^3$.

[0188] ()

[0189] , Zn, In Sn , 1
, ,
, ,
TFT .

[0190] , (a)~(h) .

[0191] (a) , $1 \times 10^{18} / \text{cm}^3$,

[0192] (b) (0 ~40
. " " , X ,
, Hall),

[0193] (c) , $0.1 \text{cm}^2 / \text{V} \cdot \text{sec}$ (a) (b) ,

[0194] (d) (b) (c) (" " ,
, 30meV .),

[0195] (e) Zn, In Sn , 1 (a) (d)

[0196] (f) (e) , Zn
2 $\text{M}_2(\text{Mg}, \text{Ca})$, In 3 $\text{M}_3(\text{B}, \text{Al}, \text{Ga}, \text{Y})$, Sn

- 4 M4(Si, Ge, Zr), 5 M5(V, Nb, Ta) Lu, W 1
- [0197] (g) $\text{In}_{1-x}\text{M}_3\text{O}_3(\text{Zn}_{1-y}\text{M}_2\text{O})_m (0 \leq x \leq 1, 0 \leq y \leq 1, m \geq 0)$ 6 (a) (f)
- [0198] (h) (a) (g)
- [0199]
- [0200] $1 \times 10^{18} / \text{cm}^3$, $1 \times 10^{15} / \text{cm}^3$
- [0201] 5V, 1×10^{-7} Zn, In, Sn
- [0202] 0.1 $200 \text{cm}^2 / \text{V} \cdot \text{sec}$
- [0203] Zn, In, Sn 0.01~ $20 \text{cm}^2 / \text{V} \cdot \text{sec}$
- [0204] Al_2O_3 , Y_2O_3 , HfO_2
- [0205] Al_2O_3 , Y_2O_3 , HfO_2 , TFT
- [0206] In_2O_3 0.1Pa
- [0207] ZnO, SnO_2 , ZnO, In_2O_3 , 20atom%, SnO_2 , In_2O_3 , 90atom%, Sn-In-O, 0.1Pa
- [0208] Al, Ga, Y), Sn 2 M2(Mg, Ca), In 3 M3(B, 4 M4(Si, Ge, Zr), 5 M5(V, Nb, Ta) Lu, W
- [0209] B, Si, Ge, In-Zn-O, 15atom% In, 20atom% Mg, In

- [0210] , , , $1 \times 10^{15} / \text{cm}^3 \sim 1 \times 10^{18} / \text{cm}^3$
- [0211] (PLD), (SP), , PLD , , SP
- [0212] (PLD In-Zn-Ga-O)
- [0213] InGaO₃(ZnO) InGaO₃(ZnO)₄ , KrF
PLD , (:1737) In-Zn-Ga-O .
- [0214] 14 , .
- [0215] 25 .
- [0216] SAXS(Small Angle X-ray Scattering) (, :0.5 °) , 2 , , 2 In-Ga-Zn-O
- [0217] In-Zn-Ga-O X , (Rrms) 0.5nm , 120nm X (XRF) , InGaO₃(ZnO) In:Ga:Zn=1.1:1.1:0.9 , InGaO₃(ZnO)₄ In:Ga:Zn=0.98:1.02:4
- [0218] InGaO₃(ZnO)₄ . 1 . 1 , 4.2Pa , $1 \times 10^{18} / \text{cm}^3$. 6.5Pa
- [0219] 5Pa , InGaO₃(ZnO)₄ , $1 \times 10^{16} / \text{cm}^3$, $1 \times 10^{-2} \text{ S/cm}$, $5 \text{ cm}^2 / \text{V} \cdot \text{sec}$. , 3eV .
- [0220] , . 1 , 6Pa 25 In-Zn-Ga-O , $8 \times 10^{15} / \text{cm}^3$ (: $8 \times 10^{-3} \text{ S/cm}$) . $1 \text{ cm}^2 / \text{V} \cdot \text{sec}$. , PLD , 6.5Pa , TFT
- [0221] InGaO₃(ZnO)₄ In-Zn-Ga-O . 2 . $1 \times 10^{16} / \text{cm}^3$ $1 \times 10^{20} / \text{cm}^3$, $3 \text{ cm}^2 / \text{V} \cdot \text{sec}$ $11 \text{ cm}^2 / \text{V} \cdot \text{sec}$. InGaO₃(ZnO)
- [0222] 200 (PET) In-Zn-Ga-O
- [0223] (PLD In-Zn-Ga-Mg-O)
- [0224] InGaO₃(Zn_{1-x}Mg_xO)₄ (0<x≤1) , InGaO₃(Zn_{1-x}Mg_xO)₄ (0<x≤1) PLD .

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- [0225] SiO_2 (:1737) . , , , 5
- $\text{InGaO}_3(\text{Zn}_{1-x}\text{Mg}_x\text{O})_4$ ($x=1-0$) (: 20mm , 5mm) . 100 ,
- [0226] , In_2O_3 , Ga_2O_3 , ZnO (4N)(:) , (1000 , 2)
(1550 , 2) .
 2×10^{-6} Pa . 0.8Pa . (25) .
30mm . 20nsec , 10Hz ,
1 × 1 mm 1.5 mJ/cm²/ KrF . 7nm/min .
0.8Pa . 25 .
- [0227] SAXS(Small Angle X-ray Scattered) (, :0.5 °) , ,
In-Ga-Zn-Mg-O .
- [0228] x (Mg) , x ,
0.8Pa In-Zn-Ga-Mg-O .
- [0229] 4a, 4b 4c . 0.4 x , 0.8Pa PLD
 1×10^{18} /cm³ . 0.4 x
1cm²/V .
- [0230] 4a, 4b, 4c , Zn 80atom% Mg , 0.8Pa(
: 1×10^{-2} S.cm) 1×10^{16} /cm³
 , Mg ,
5cm²/V.sec , 1 .
 , Mg , Mg
 , 20atom%~85atom% (0.2 < x < 0.85, 0.5 < x < 0.85).
- [0231] 200 (PET) $\text{InGaO}_3(\text{Zn}_{1-x}\text{Mg}_x\text{O})_4$ (0 < x ≤ 1)
- [0232] (PLD In_2O_3)
- [0233] KrF PLD , In_2O_3 200 PET
 In_2O_3 .
- [0234] 14 . SiO_2 (:1737) .
- [0235] , , , 5
100 .
- [0236] , In_2O_3 (: 20mm , 5mm) , In_2O_3 (4N)(1000 , 2) ,
(1550 , 2) .
- [0237] 2×10^{-6} Pa 5Pa , 25 .
- [0238] 0.1Pa , (Radical) 200W , .
- [0239] 40mm , KrF 0.5 mJ/cm²/
20nsec , 10Hz , 1 × 1 mm .

- [0240] 3nm/min .
- [0241] SAXS(Small Angle X-ray Scattered) (, :0.5 °) , ,
In-0 . 80nm .
- [0242] In-0 , $5 \times 10^{17}/\text{cm}^3$, ,
 $7\text{cm}^2/\text{V}\cdot\text{sec}$.
- [0243] (PLD In-Sn-0)
- [0244] KrF PLD , $(\text{In}_{0.9}\text{Sn}_{0.1})\text{O}_{3.1}$,
200 PET In-Sn-0 . 14 .
- [0245] SiO_2 (:1737) .
- [0246] , , , 5
100 .
- [0247] , $\text{In}_2\text{O}_3\text{-SnO}_2$ (: 20mm , 5mm) , $\text{In}_2\text{O}_3\text{-SnO}_2(4\text{N})$ (:)
(1000 , 2) , (1550 , 2)
.
- [0248] . 5Pa . , 0.1Pa .
200W , .
- [0249] 30mm , KrF $1.5 \text{ mJ}/\text{cm}^2/$,
20nsec , 10Hz , $1 \times 1 \text{ mm}$.
- [0250] 6nm/min .
- [0251] SAXS(Small Angle X-ray Scattered) (, :0.5 °) , ,
In-Sn-0 .
- [0252] In-Sn-0 , , $8 \times 10^{17}/\text{cm}^3$, ,
 $5\text{cm}^2/\text{V}\cdot\text{sec}$. , 100nm .
- [0253] (PLD In-Ga-0
- [0254] SiO_2 (:1737) .
- [0255] , , , 5
100 .
- [0256] , $(\text{In}_2\text{O}_3)_{1-x}-(\text{Ga}_2\text{O}_3)_x(x=0-1)$ (: 20mm , 5mm) . , $x=0.1$,
 $(\text{In}_{0.9}\text{Ga}_{0.1})_2\text{O}_3$.
- [0257] , $\text{In}_2\text{O}_3\text{-Ga}_2\text{O}_3(4\text{N})$ (:) , (1000 , 2)
(1550 , 2) .
- [0258] $2 \times 10^{-6} \text{ Pa}$. 1Pa .
- [0259] . 30mm . KrF $1.5 \text{ mJ}/\text{cm}^2/$
20nsec . 10Hz . $1 \times 1 \text{ mm}$.
6nm/min .
- [0260] , 25 . 1Pa . SAXS(Small Angle X-ray Scattered) (,
:0.5 °) , , In-Ga-0

- [0261] In-Ga-0, $8 \times 10^{16} / \text{cm}^3$, $1 \text{cm}^2 / \text{V} \cdot \text{sec}$.
- [0262] (In-Zn-Ga-0 TFT ())
- [0263] 5 TFT.
- [0264] (1), $\text{InGaO}_3(\text{ZnO})_4$ 5Pa, PLS In-Ga-Zn-0, In-Ga-Zn-0 120nm, (2).
- [0265] 1Pa PLD In-Ga-Zn-0, 30nm, (5), (6).
- [0266] (3) Y_2O_3 (:90nm, : 15, :0.5MV/cm $1 \times 10^{-3} \text{A/cm}^2$), (4), 50, 200.
- [0267] TFT
- [0268] 6, TFT - V_{DS} , I_{DS} , n.
- [0269] In-Ga-Zn-0 n, I_{DS} , $V_{\text{DS}}=6\text{V}$ (), $V_{\text{DS}}=4\text{V}$, $V_{\text{GS}}=-0.5\text{V}$, $V_{\text{G}}=10\text{V}$, $I_{\text{DS}}=1.0 \times 10^{-5} \text{A}$, In-Ga-Zn-0.
- [0270] - , 1×10^3 , $7 \text{cm}^2 (\text{Vs})^{-1}$.
- [0271] $1 \times 10^{18} / \text{cm}^3$ TFT, $1 \times 10^{17} / \text{cm}^3$, $1 \times 10^{16} / \text{cm}^3$.
- [0272] (In-Zn-Ga-0 TFT ())
- [0273] 5 TFT.
- [0274] (PET) (1), PLS, $\text{InGaO}_3(\text{ZnO})$ 5Pa, In-Ga-Zn-0, 120nm, (2).
- [0275] 1Pa, PLD In-Ga-Zn-0, 30nm, (5), (6).
- [0276] (3), (4), 50, 200, Y_2O_3 (140nm), Al_2O_3 (130), HfO_2 (:140) 3, TFT 3.

- [0277] TFT
- [0278] PET TFT 6 - .
 V_{DS} I_{DS} , n . ,
 In-Ga-Zn-0 n . I_{DS} $V_{DS}=6V$ ()
 . $V_G=0V$ $I_{DS}=1.0 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=2.0 \times 10^{-5} A$
 . In-Ga-Zn-0
- [0279] - , 1×10^3 . , ,
 $7cm^2(Vs)^{-1}$.
- [0280] PET , 30mm , , .
 , .
- [0281] Al_2O_3 TFT , 6 . $V_G=0V$
 $I_{DS}=1.0 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=5.0 \times 10^{-6} A$. - , $1 \times$
 10^2 . , ,
 $2cm^2(Vs)^{-1}$.
- [0282] HfO_2 TFT , 6 . $V_G=0V$
 $I_{DS}=1 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=1.0 \times 10^{-6} A$. - , $1 \times$
 10^2 . , ,
 $10cm^2(Vs)^{-1}$.
- [0283] (PLD In_2O_3 TFT)
- [0284] 5 TFT .
- [0285] , (PET) (1) , PLD , (2) 80nm In_2O_3
 .
- [0286] , , 1Pa ,
 , PLD , In_2O_3 30nm .
 , (5) (6) .
- [0287] , (3) Y_2O_3 . , ,
 , (4) .
- [0288] TFT
- [0289] PET TFT - . V_{DS} ,
 I_{DS} , n . , In-0 n
 . I_{DS} $V_{DS}=6V$ ()
 . $V_G=0V$ $I_{DS}=2 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=2.0 \times 10^{-6} A$.
 In-0 .
- [0290] - , 1×10^2 . , ,

$$1 \times 10 \text{ cm}^2 (\text{Vs})^{-1}$$

TFT

•

[0291]	PET		30mm			
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[0292] (PLD In-Sn-0 TFT)

[0293]	5	TFT	.
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[0294] , (PET) (1) , PLD , (2) 100nm In-Sn-0

[0295] , PLD , 1Pa , In-Sn-0 30nm .
(5) (6) .

[0296] , (3) Y_2O_3 . , (4) .

[0297] TFT

[0298] PET TFT - V_{DS}

I_{DS} , n, In-Sn-0 n

I_{DS} $V_{DS}=6V$ ()

$V_G=0V$ $I_{DS}=5 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=5.0 \times 10^{-5} A$.

In-Sn-0.

[0299] $\frac{1 \times 10^3}{5 \text{ cm}^2 (\text{Vs})^{-1}}$ TFT.

[0300] PET, 30mm, .

[0301] (PLD In-Ga-0 TFT)

[0302] 5 TFT .

[0303] (PET) (1) 6 PLD (2)
120nm In-Ga-0 .

[0304] , PLD , In-Ga-0 30nm .
(5) (6) .

[0305] , (3) Y_2O_3 . , , (4) .

[0306] TFT

[0307] PET TFT - V_{DS}

I_{DS} , n, In-Ga-0

n, I_{DS} $V_{DS}=6V$ ()

$V_G=0V$ $I_{DS}=1 \times 10^{-8} A$, $V_G=10V$, $I_{DS}=1.0 \times 10^{-6} A$

In-Ga-0

[0308] - 1×10^2 . ,

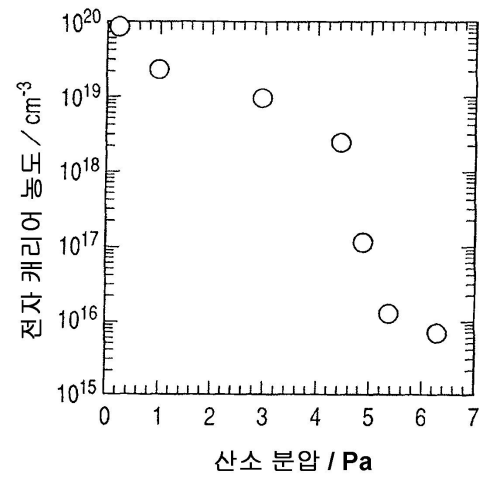
- [0309] PET, 30mm, TFT.
- [0310] $1 \times 10^{18} / \text{cm}^3$ TFT.
 $1 \times 10^{17} / \text{cm}^3$, $1 \times 10^{16} / \text{cm}^3$.
- [0311],
- [0312] (1)
- [0313].
- [0314] In-Ga-Zn-O, PLD, In:Ga:Zn=0.98:1.02:4.
- [0315], 5 MISFET:
- [0316] (1) In-Ga-Zn-O, (2) 120nm InGaO₃(ZnO)₄; 1Pa
 InGaO₃(ZnO)₄ 30nm,
 (3) Y₂O₃, (5) (6);
 (4) 0.5MV/cm $1 \times 10^{-3} \text{ A/cm}^2$, : 90nm, : 15, :
 (4).
- [0317] (MISFET)
- [0318] 6, MISFET / V_{DS} ,
 I_{DS} n, In-Ga-Zn-O n
 MISFET, I_{DS} 6V V_{DS} (V_{GS})
 , 4V V_{DS} V_{GS}
 -0.5V, 10 V_G , I_{DS} $1.0 \times 10^{-5} \text{ A}$,
 In-Ga-Zn-O.
- [0319] /, 1×10^3 ,
 $7 \text{ cm}^2 (\text{Vs})^{-1}$.
- [0320] MISFET, MISFET,
 300nm.
- [0321], Al 300nm, Al Ag 50nm.
- [0322], (tris)(8-), 20nm
 4, 4'- (2, 2-) 40nm, 4, 4'- [1-
 ())-N- 20nm, [N, N-]-4'' -]
 60nm, EL.
- [0323], ITO 200nm.

[illegible]

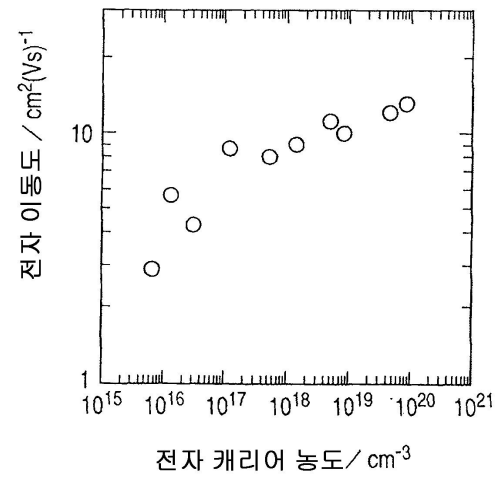
- [0343] , In₂O₃:Sn , ,
EL
α -NPD, 6 Ir(ppy)₃ CBP, Alq₃, AgMg
- [0344] ,
- [0345] Alq₃ - ;
- [0346] α -NPD;
- [0347] Ir(ppy)₃ - .
- [0348] , 2170 , ,
.
- [0349] , , .
- [0350] , 12 TFT EL
In₂O₃:Sn TFT
TFT .
- [0351] 12 , 2200 , 2201 , 2202 , 2203 ,
2204 , 2205 , 2206 (1), 2207 , 2208 ,
2209 , 2210 , 2211 , 2250 TFT , 2260 .
- [0352] , 12 , (2205) , (2210)
 , (2202) (2210)
.
- [0353] , 2270
EL ()
.
- [0354] (4: ,)
- [0355] , .
- [0356] , , ,
.
- [0357] , , 13 , ,
 , ,
 , SELFOC .
- [0358] 13 , 2300 , 2350 .
- [0359] ,
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- [0360] , 1 , ,
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- [0361] , ()
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- [0362] []
- [0363] , IC ID .
- [0364] , , , , .
- [0365] 2004 11 10 2004-
326684 .
- [0366] 1 In-Ga-Zn-0
- [0367] 2 In-Ga-Zn-0 ,
- [0368] 3 In-Ga-Zn-0
- [0369] 4a, 4b, 4c 0.8Pa $\text{InGaO}_3(\text{Zn}_{1-x}\text{Mg}_x\text{O})$ x
- [0370] 5 1 MISFET ,
- [0371] 6 1 MISFET - ,
- [0372] 7 ,
- [0373] 8 ,
- [0374] 9 ,
- [0375] 10 ,
- [0376] 11 ,
- [0377] 12 (),
- [0378] 13 , , ,
- [0379] 14 ,
- [0380] 15 .

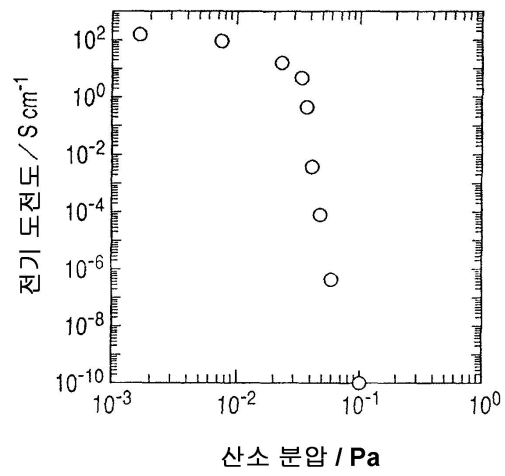
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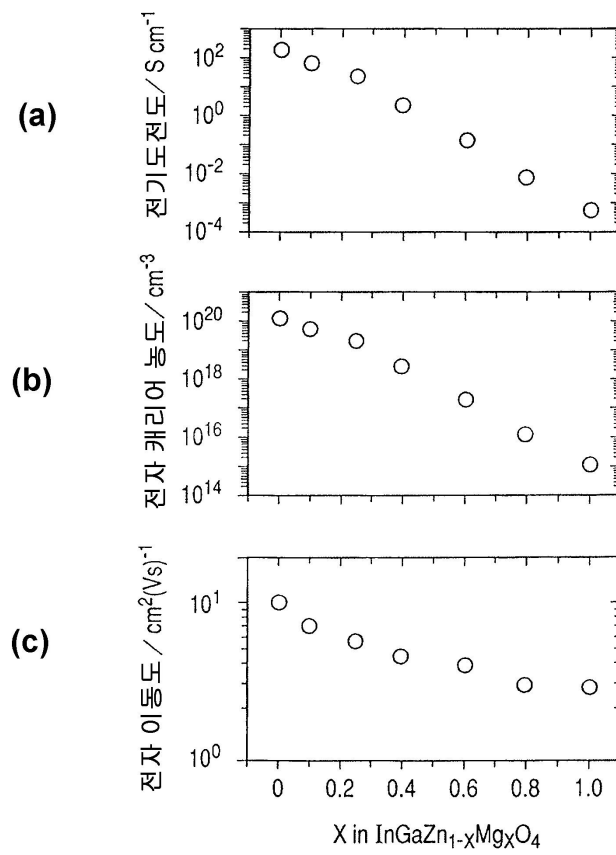
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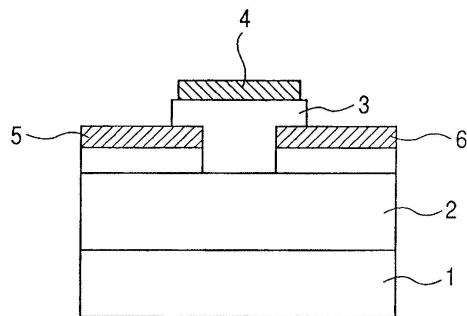
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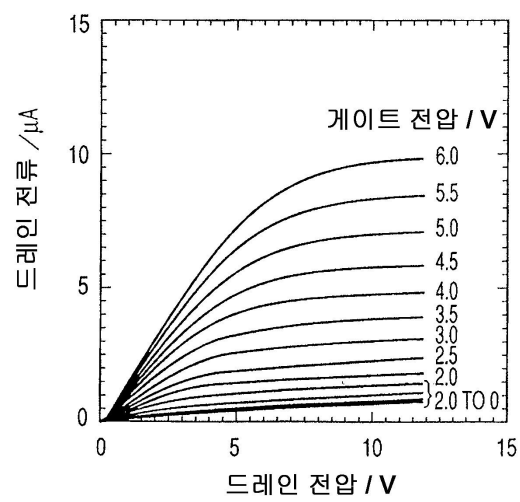
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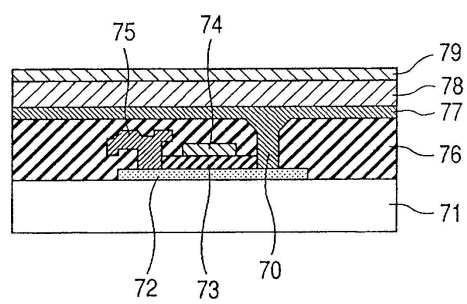
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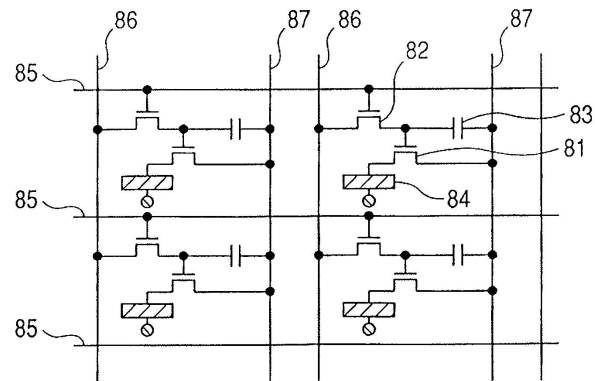
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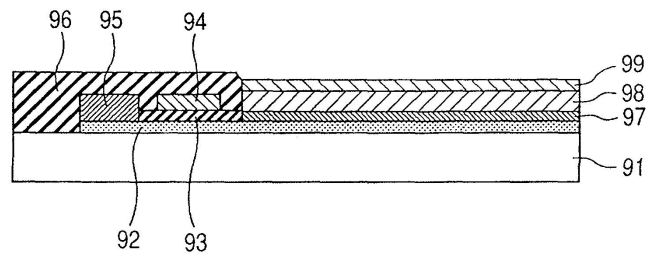
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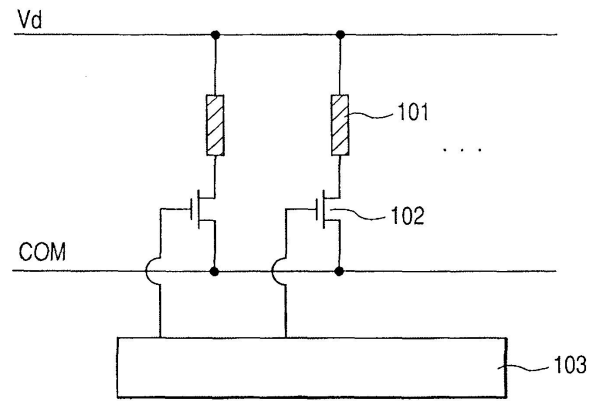
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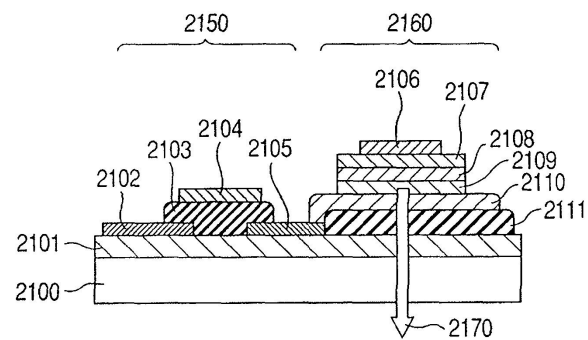
9



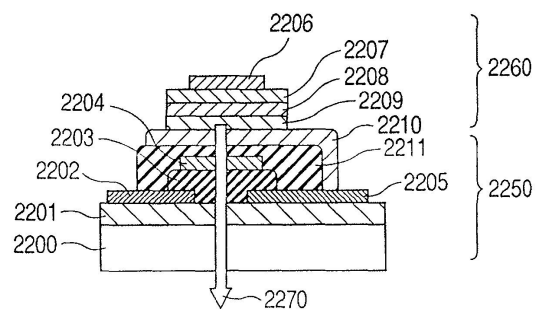
10



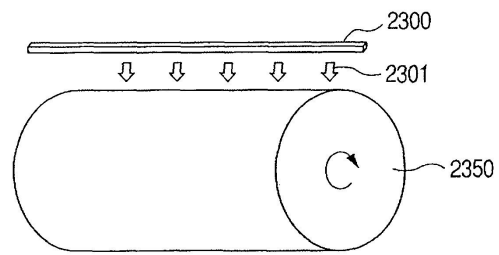
11



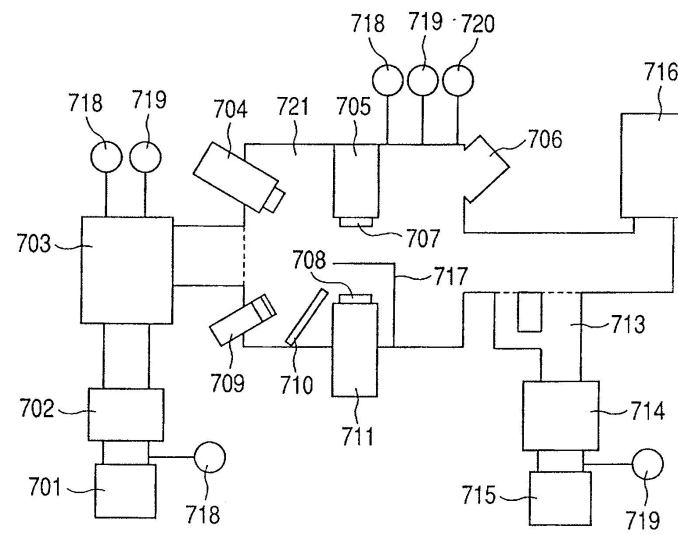
12



13



14



15

