FIG. 1A

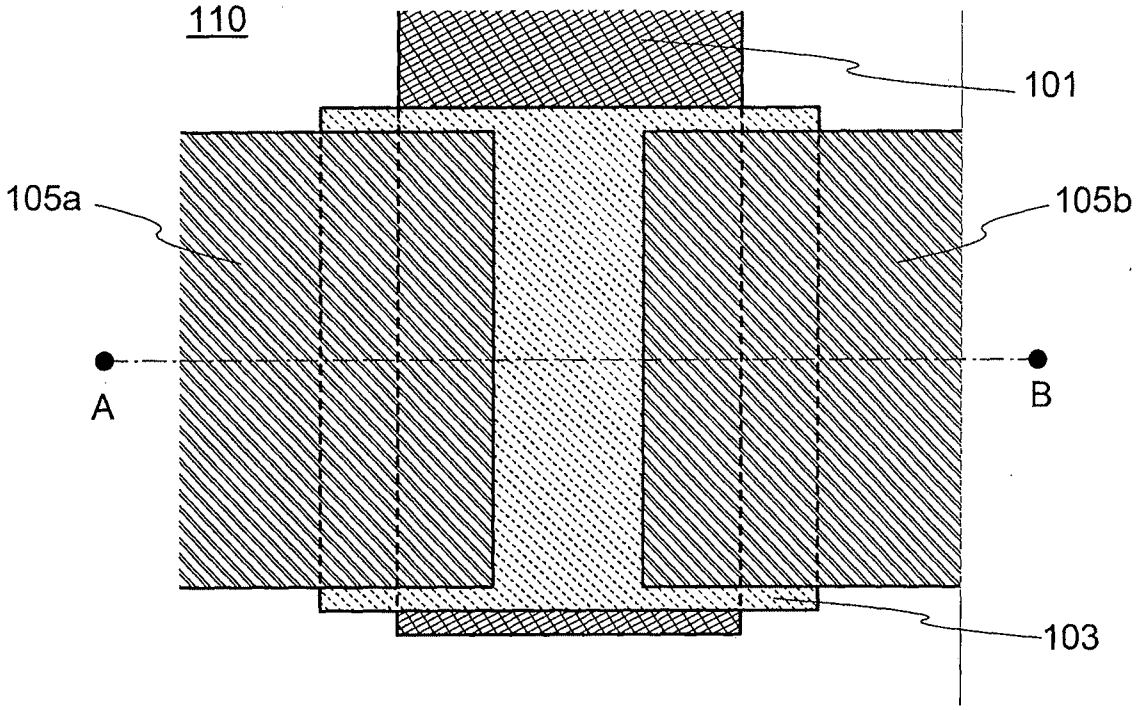

110
101
105a
105b
A
B
103

FIG. 1B

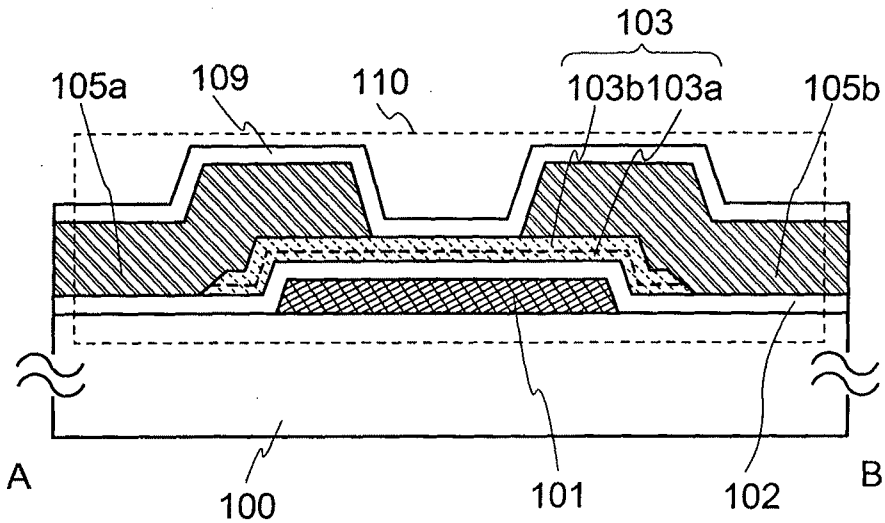

103
105a
109
110
103b
103a
105b
A
100
101
102
B

FIG. 2A

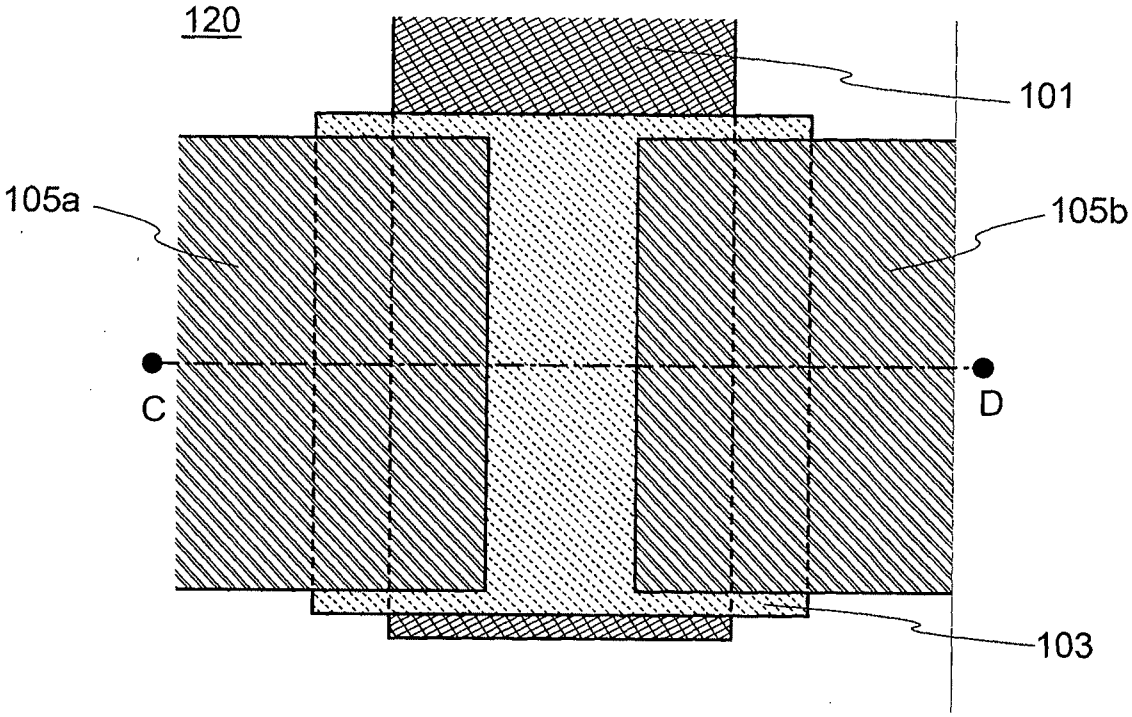

120
101
105a
105b
C
D
103

FIG. 2B

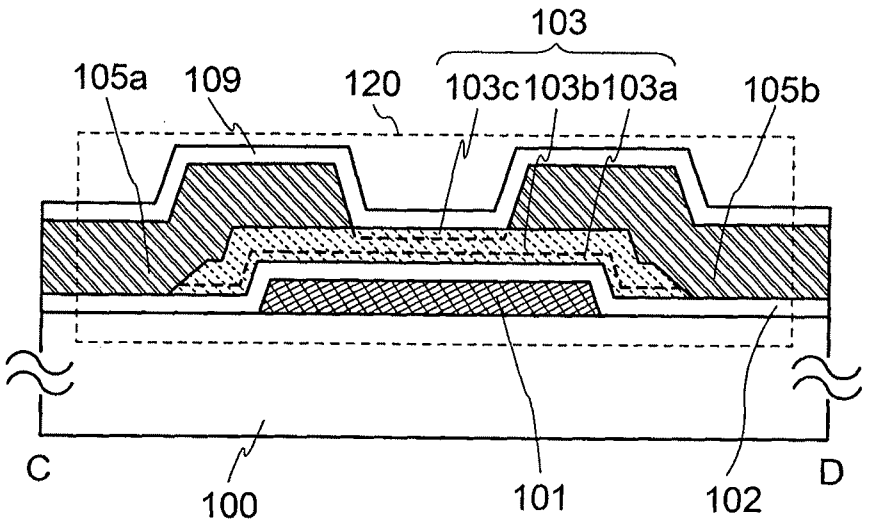

103
105a
109
120
103c
103b
103a
105b
C
D
100
101
102

FIG. 3A

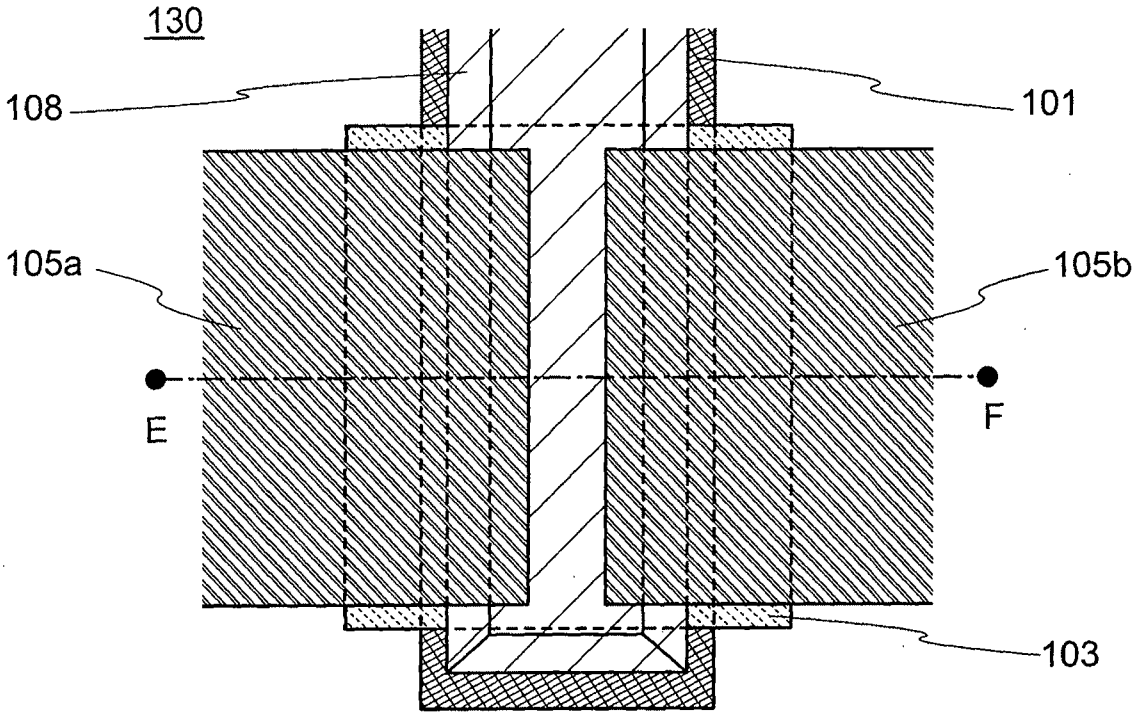

130
108
101
105a
105b
E
F
103

FIG. 3B

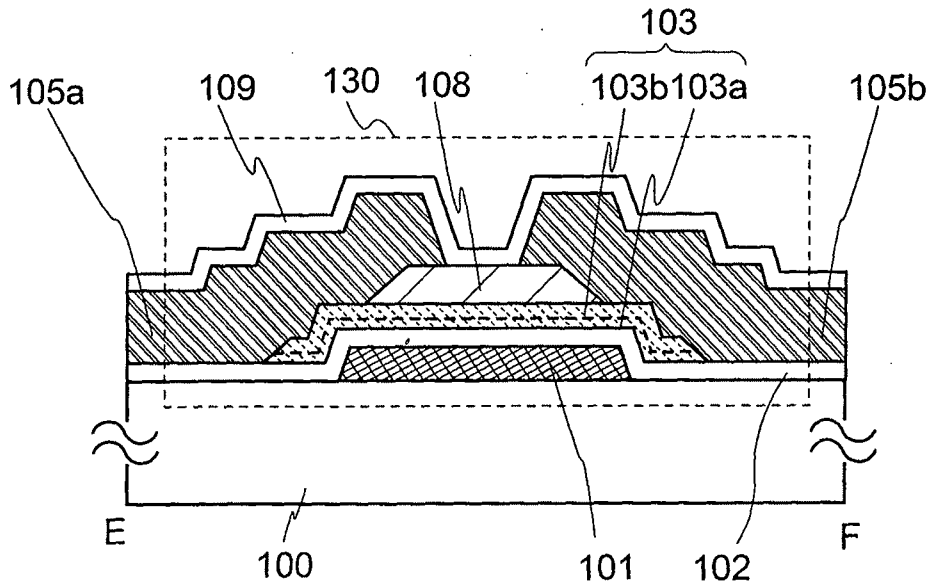

103
105a
109
130
108
103b
103a
105b
E
F
100
101
102

FIG. 4A

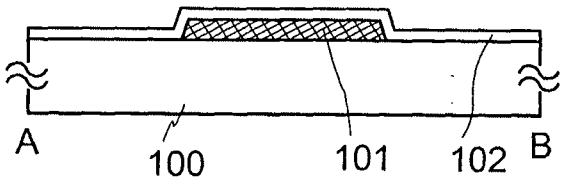


FIG. 4B

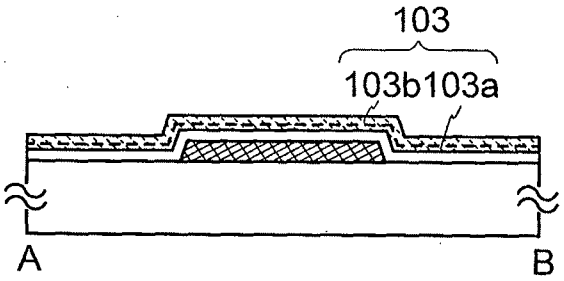


FIG. 4C

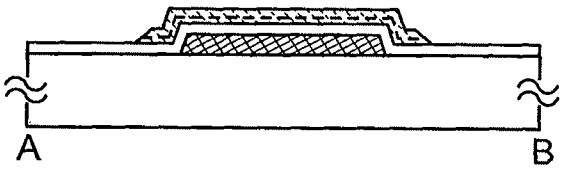


FIG. 4D

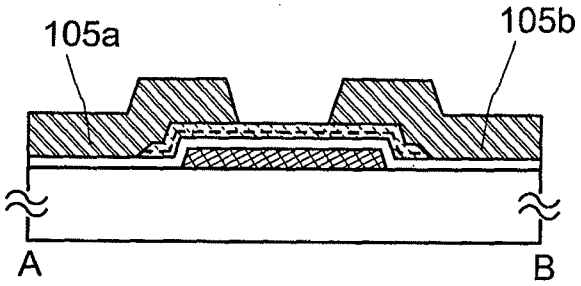


FIG. 4E

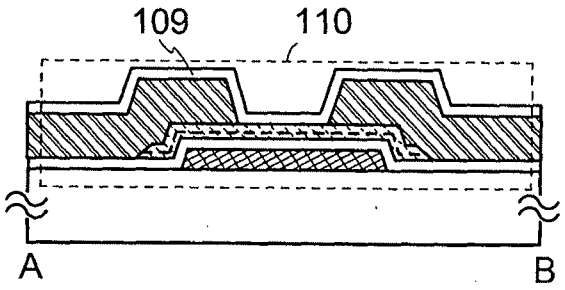


FIG. 5A

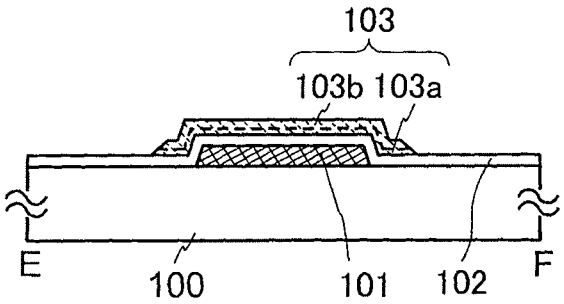


FIG. 5B

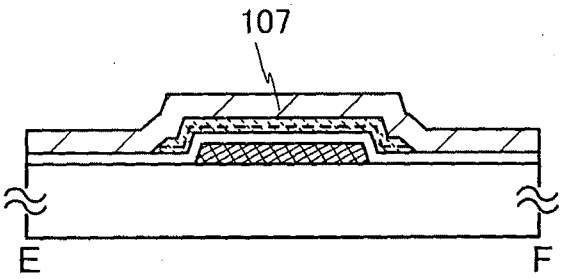


FIG. 5C

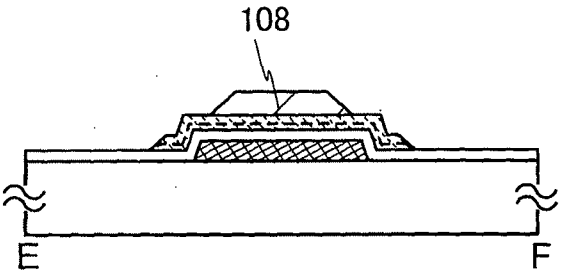


FIG. 5D

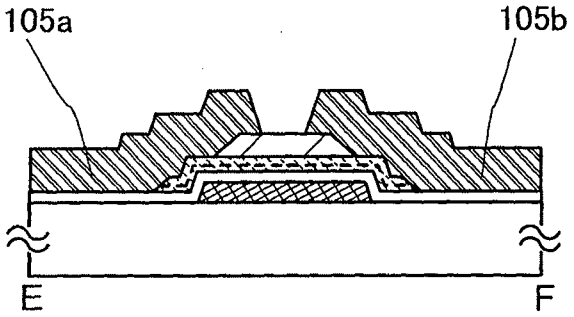


FIG. 5E

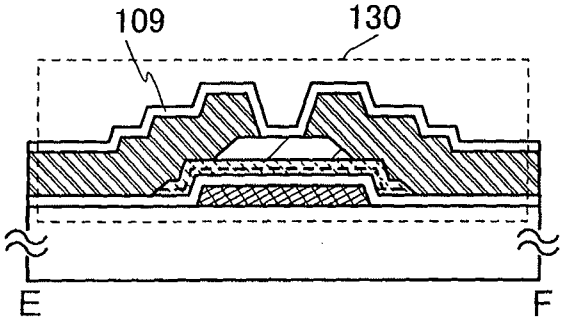


FIG. 6

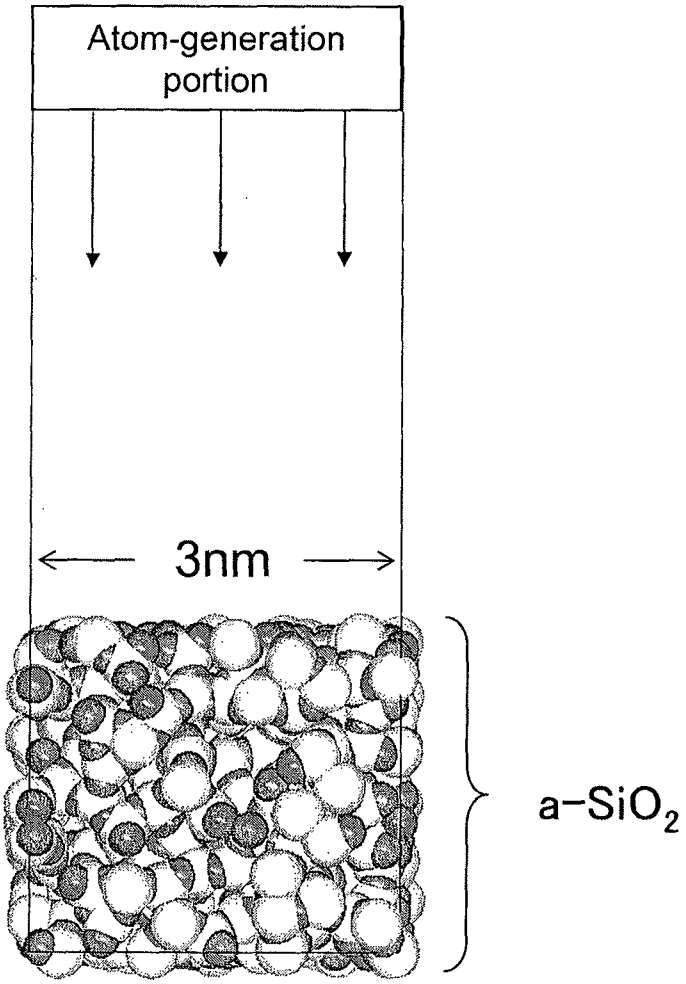


FIG. 7A

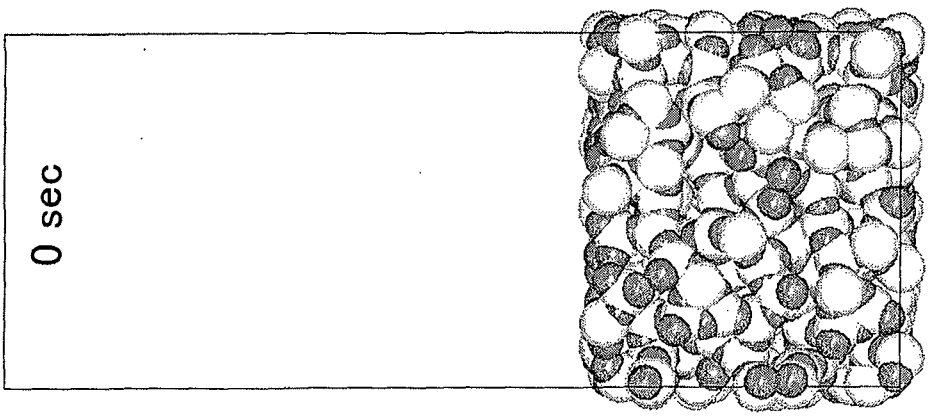


FIG. 7B

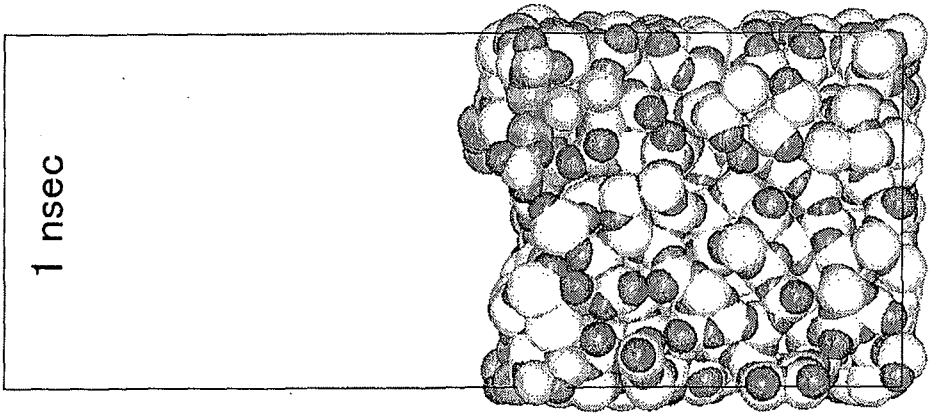
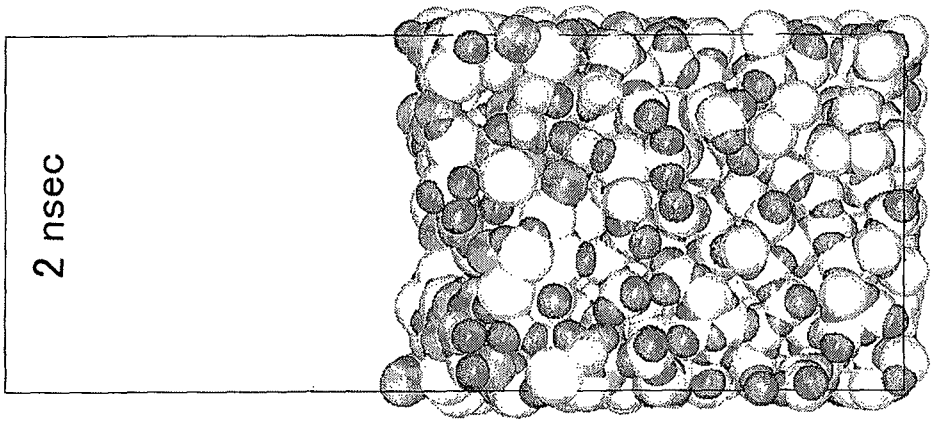


FIG. 7C



In Ga Zn O Si

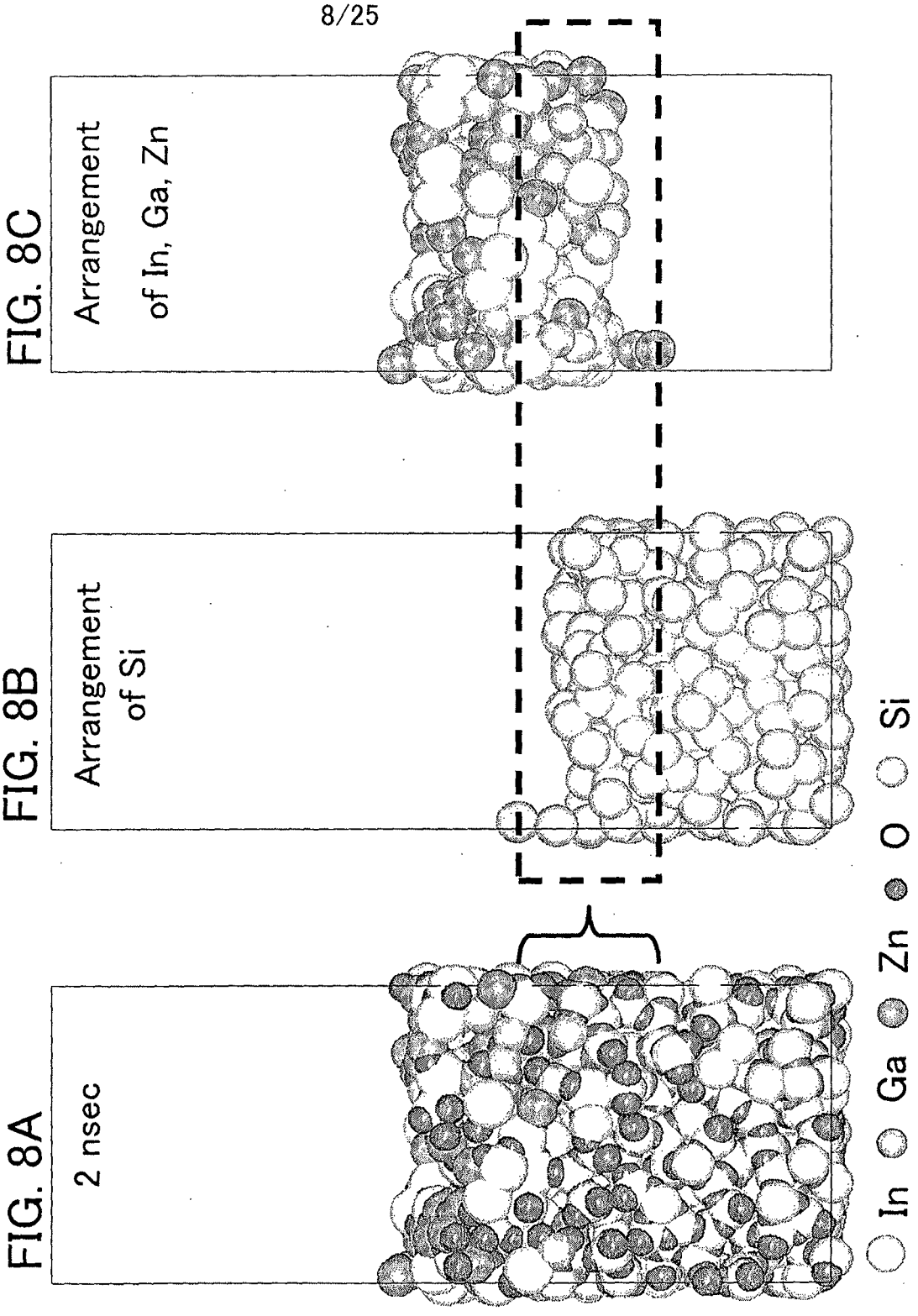

FIG. 8A
2 nsec
FIG. 8B
Arrangement of Si
FIG. 8C
Arrangement of In, Ga, Zn
In
Ga
Zn
O
Si

FIG. 9A

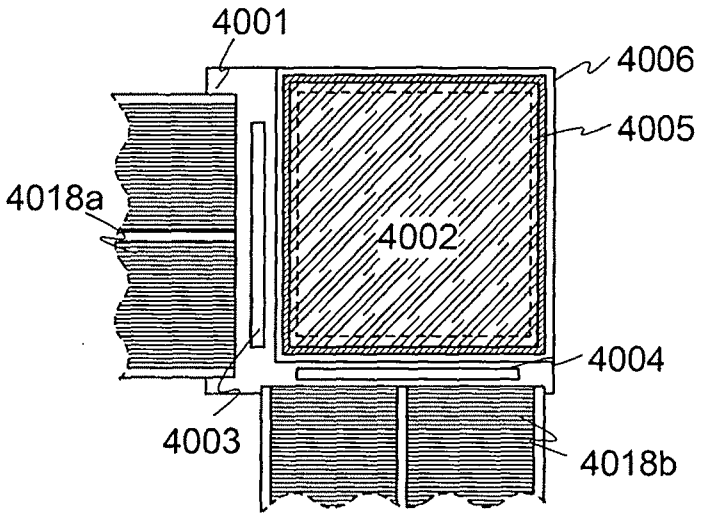


FIG. 9B

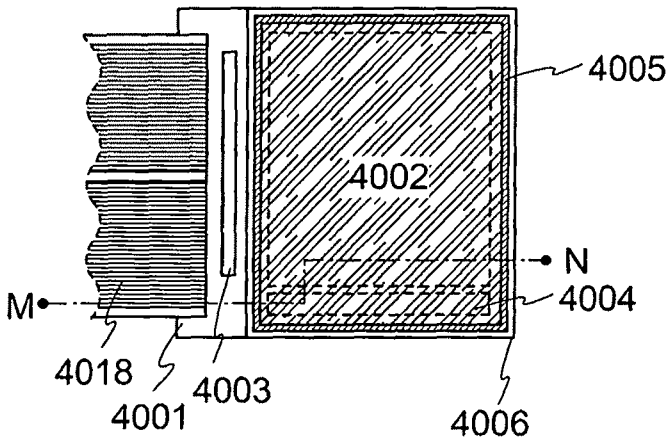


FIG. 9C

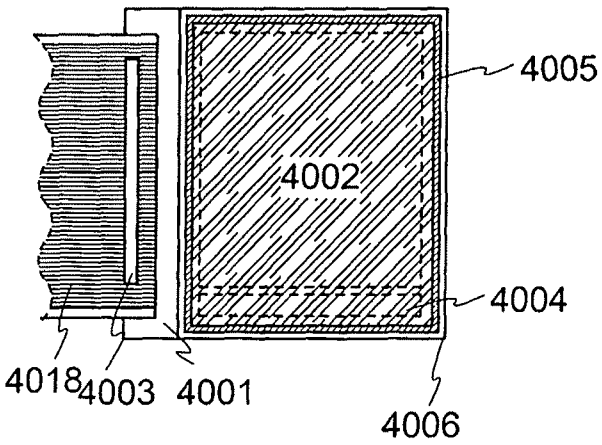


FIG. 10

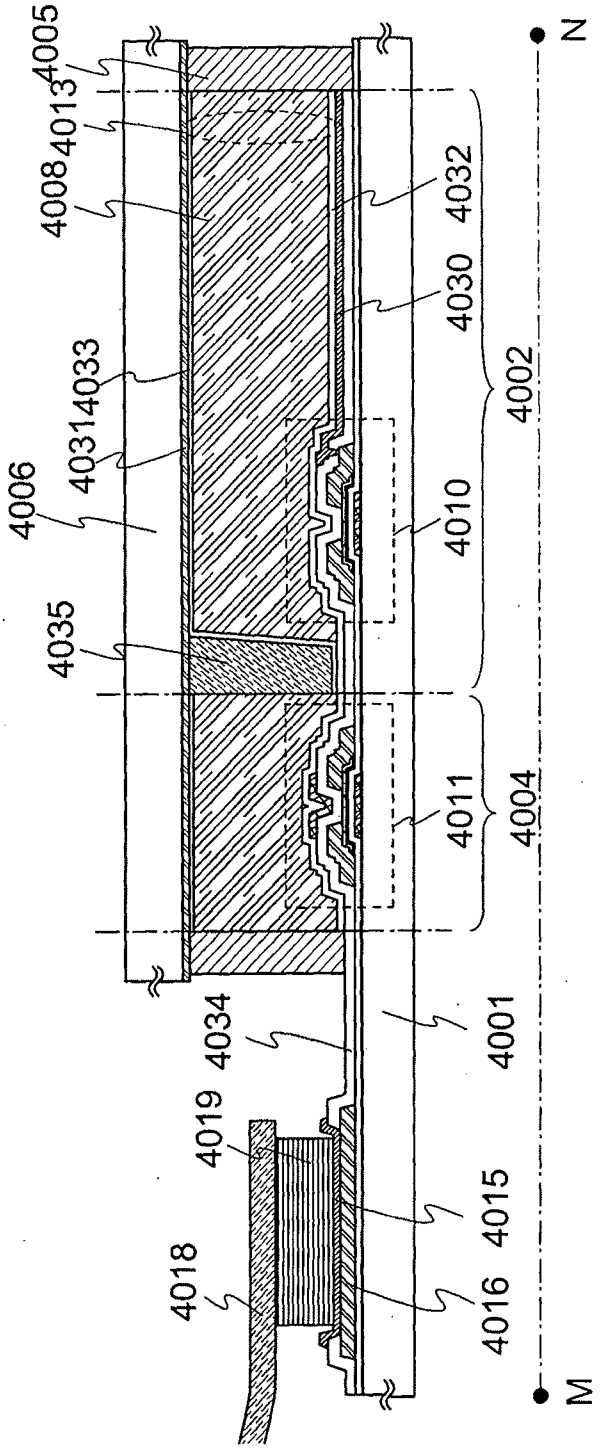

4005
4013
4008
4032
4030
4033
4031
4002
4006
4010
4035
4011
4004
4034
4001
4019
4015
4018
4016
N
M

FIG. 11

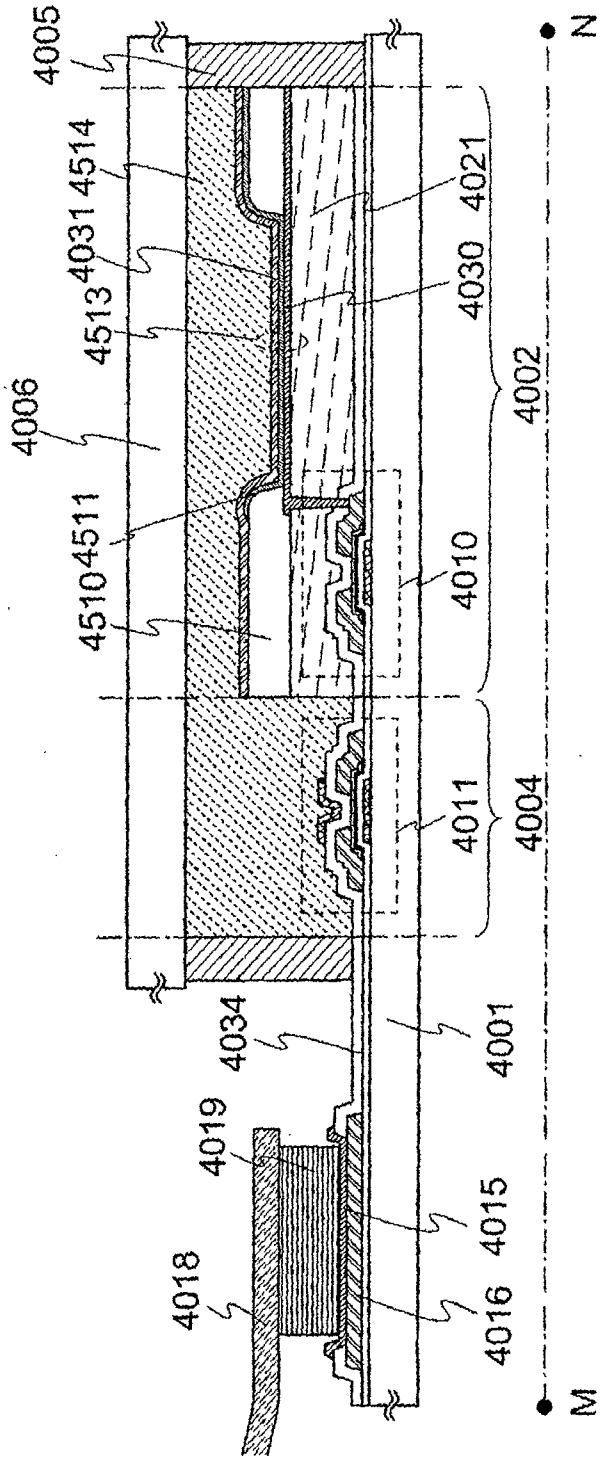

4005
4514
4031
4513
4006
4511
4510
4021
4030
4002
4010
4011
4004
4034
4001
4019
4015
4018
4016
N
M

FIG. 12

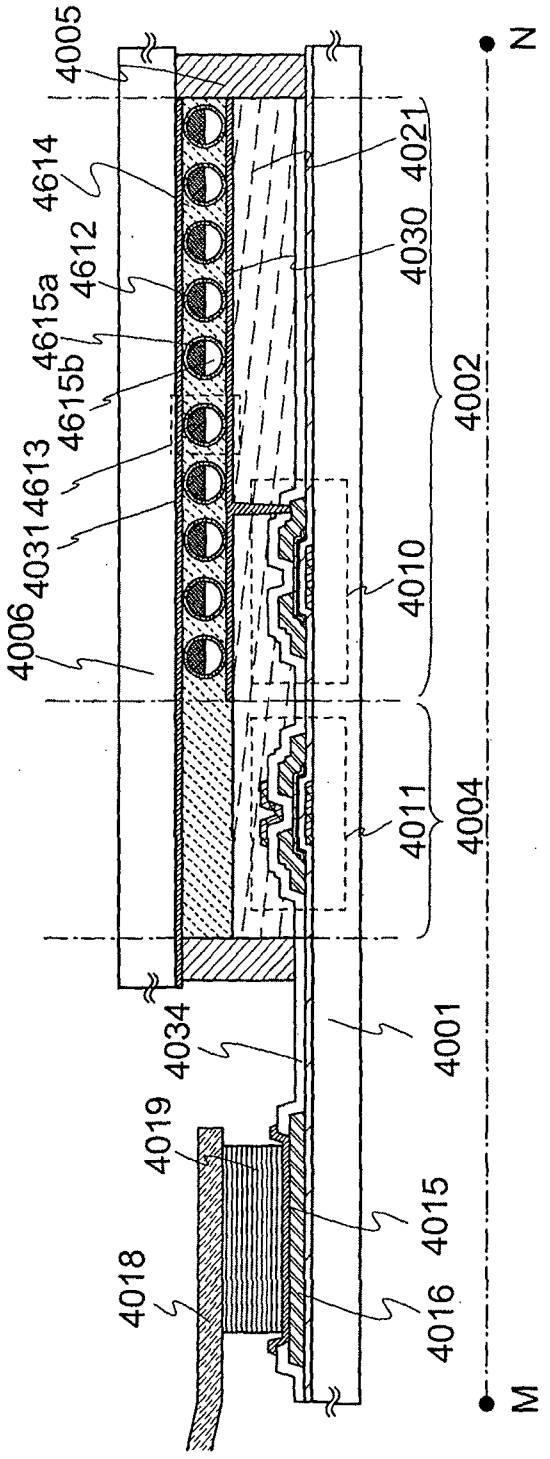

4005
4614
4612
4615a
4615b
4613
4031
4006
4021
4030
4002
4010
4011
4004
4034
4001
4019
4015
4018
4016
N
M

FIG. 13A

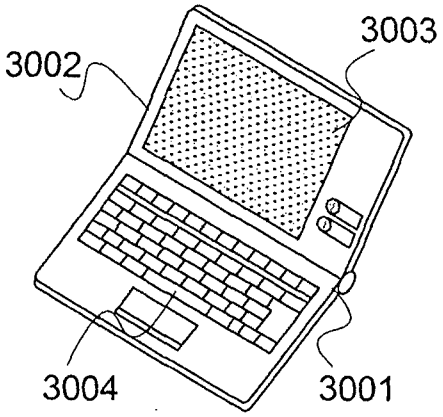


FIG. 13B

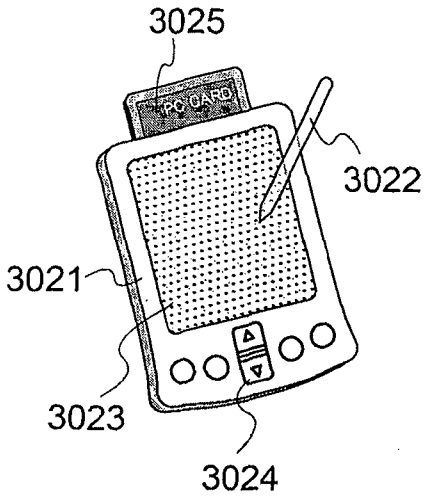


FIG. 13C

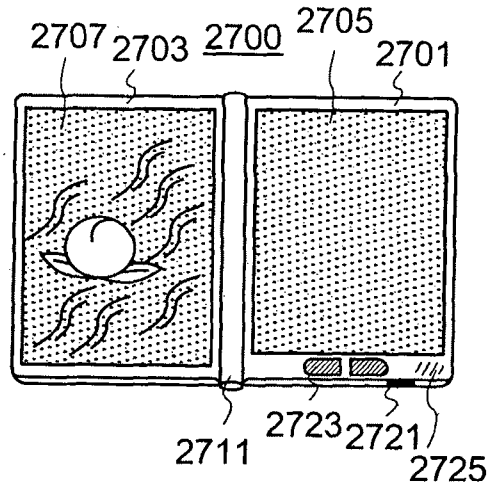


FIG. 13D

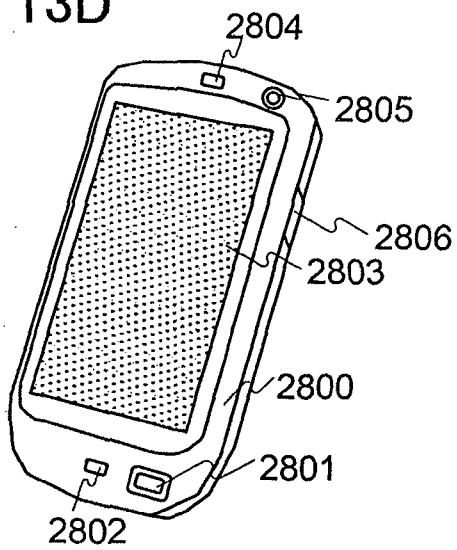


FIG. 13E

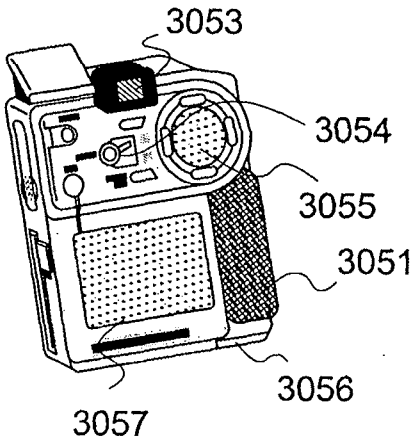


FIG. 13F

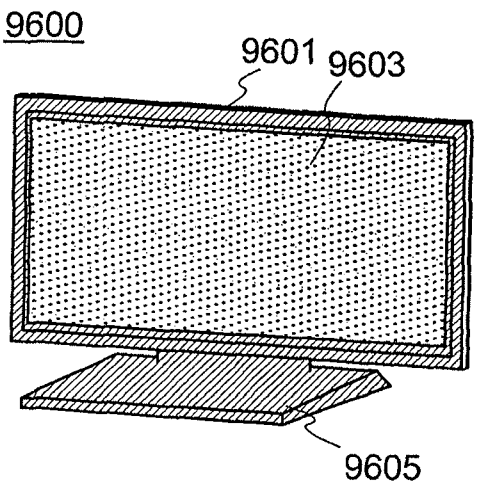


FIG. 14

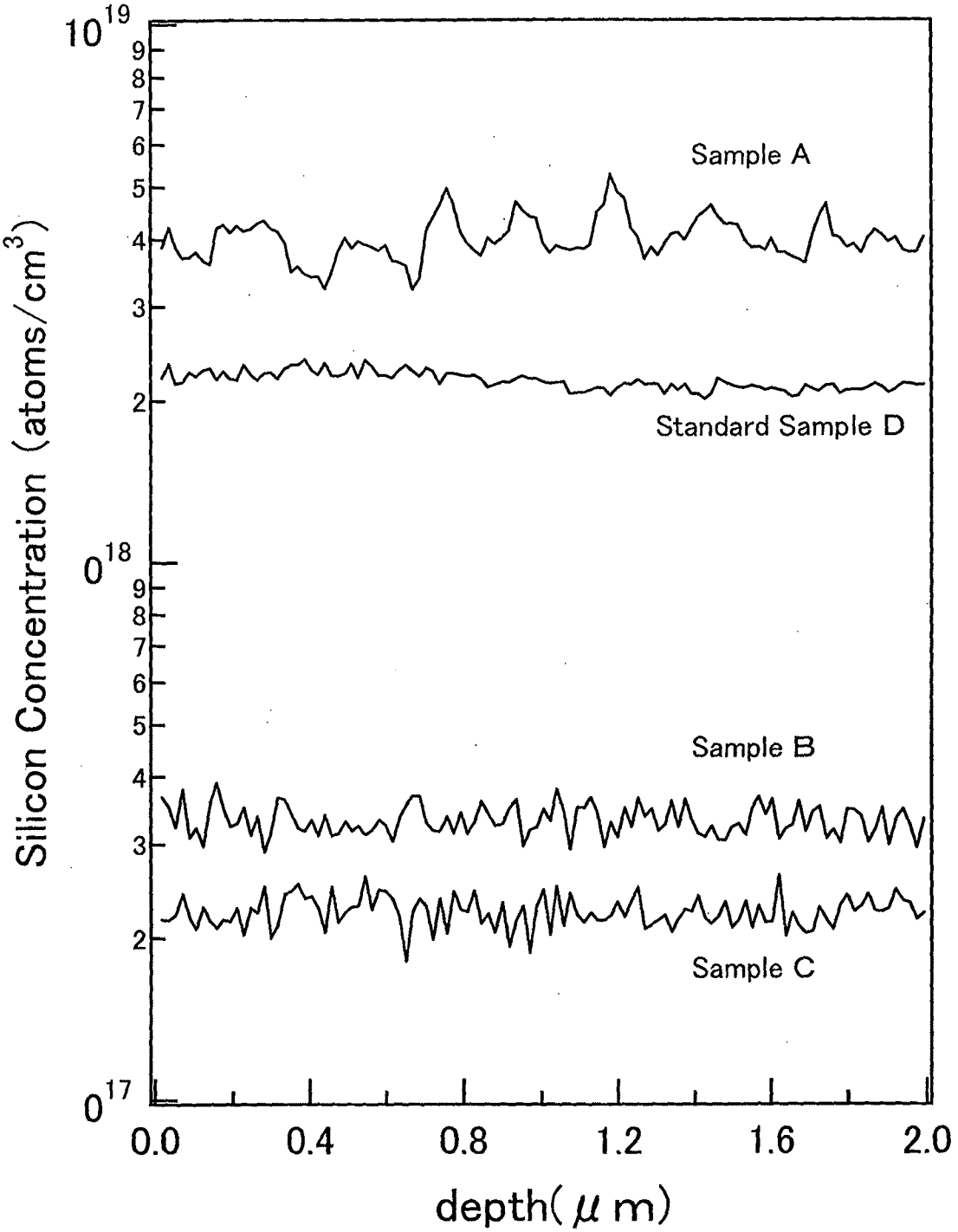

Silicon Concentration (atoms/cm3)
10^19
9
8
7
6
5
4
3
2
0^18
9
8
7
6
5
4
3
2
0^17
Sample A
Standard Sample D
Sample B
Sample C
0.0
0.4
0.8
1.2
1.6
2.0
depth(μm)

FIG. 15

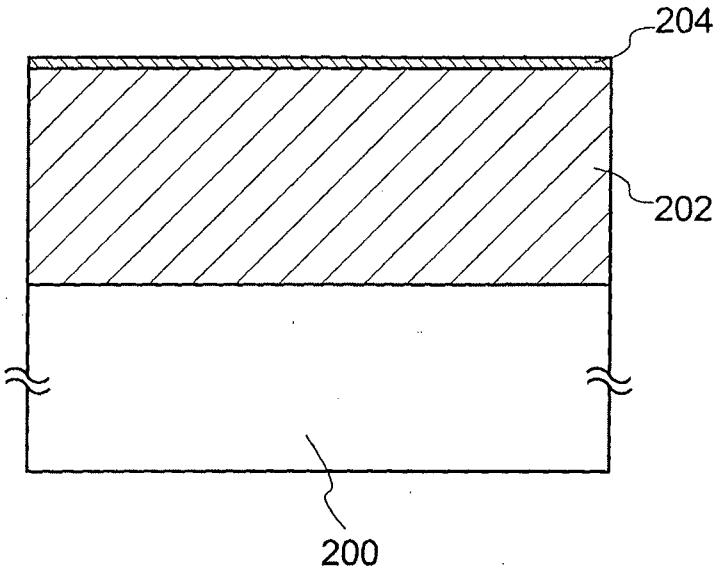


FIG. 16

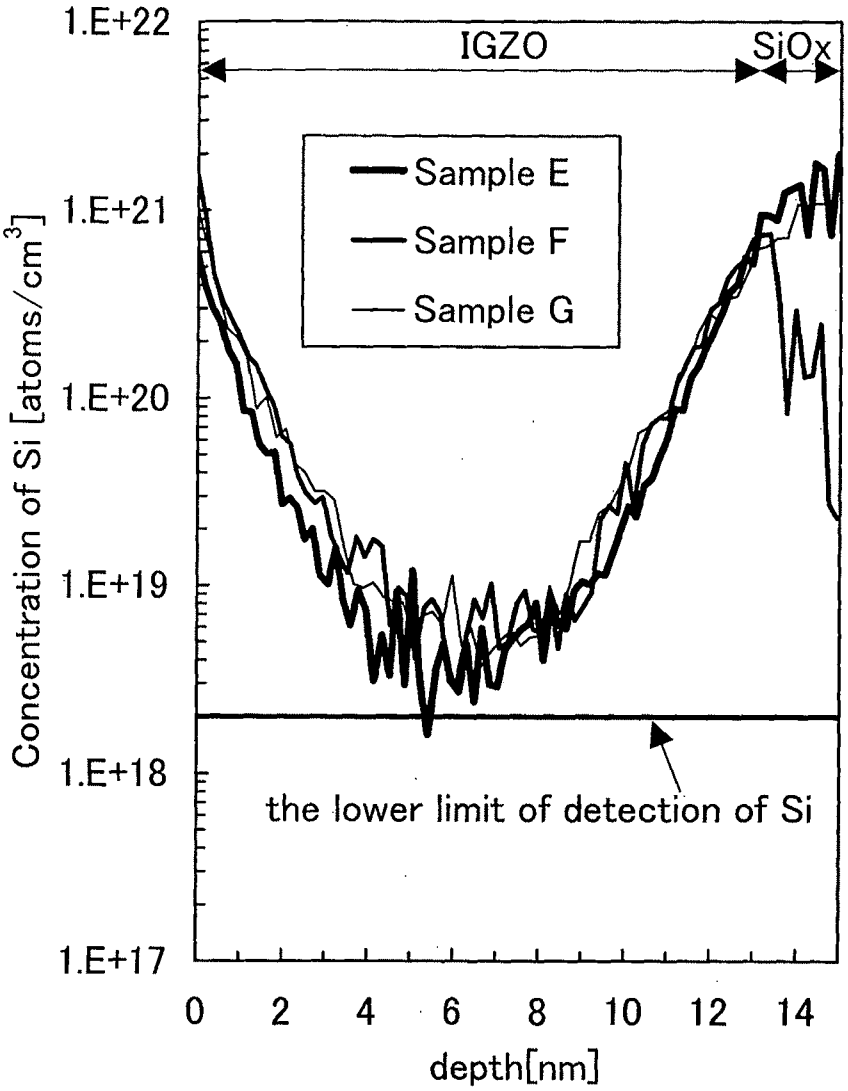

IGZO
SiOx
Sample E
Sample F
Sample G
Concentration of Si [atoms/cm3]
1.E+22
1.E+21
1.E+20
1.E+19
1.E+18
1.E+17
the lower limit of detection of Si
0
2
4
6
8
10
12
14
depth[nm]

FIG. 17

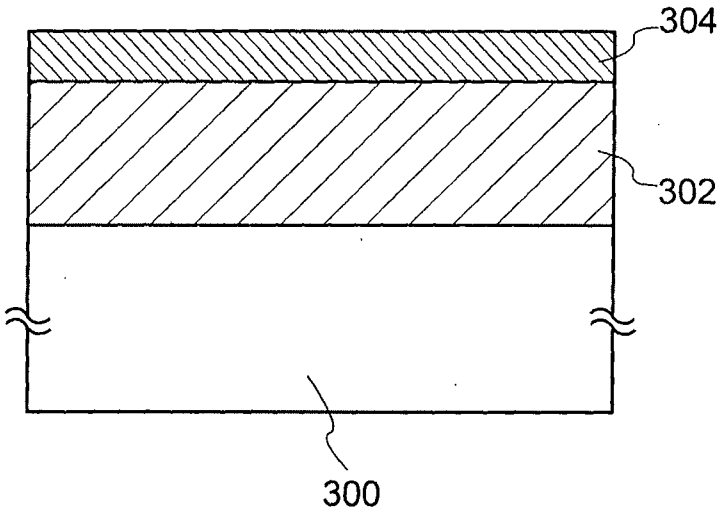


FIG. 18A

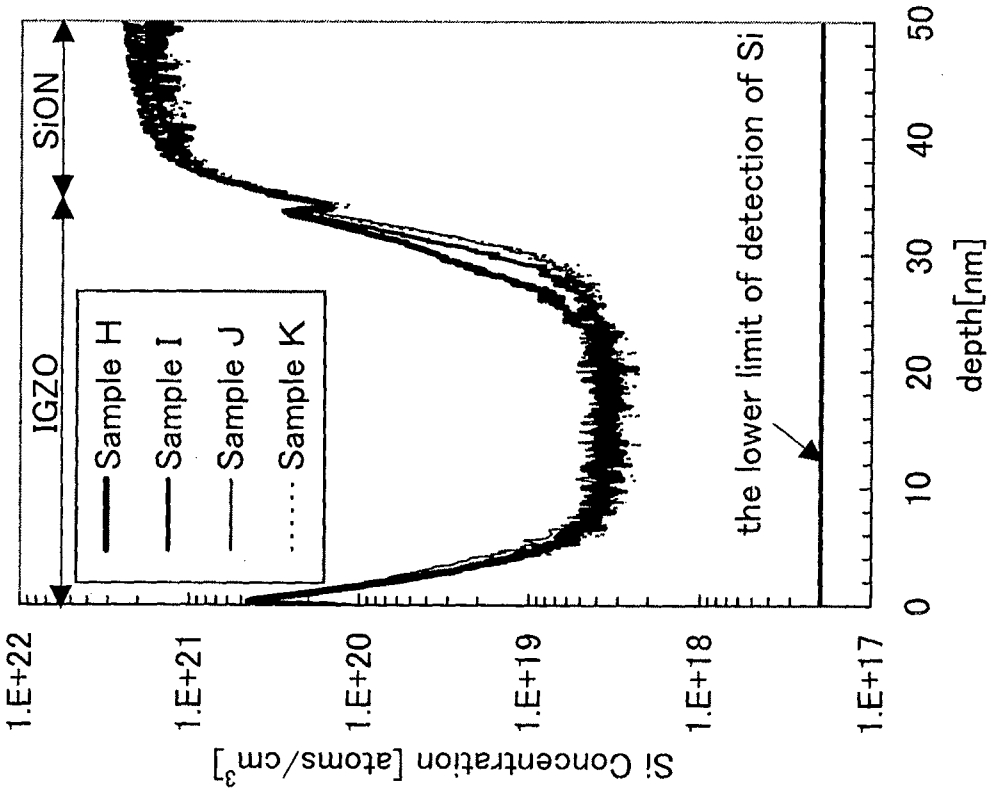


FIG. 18B

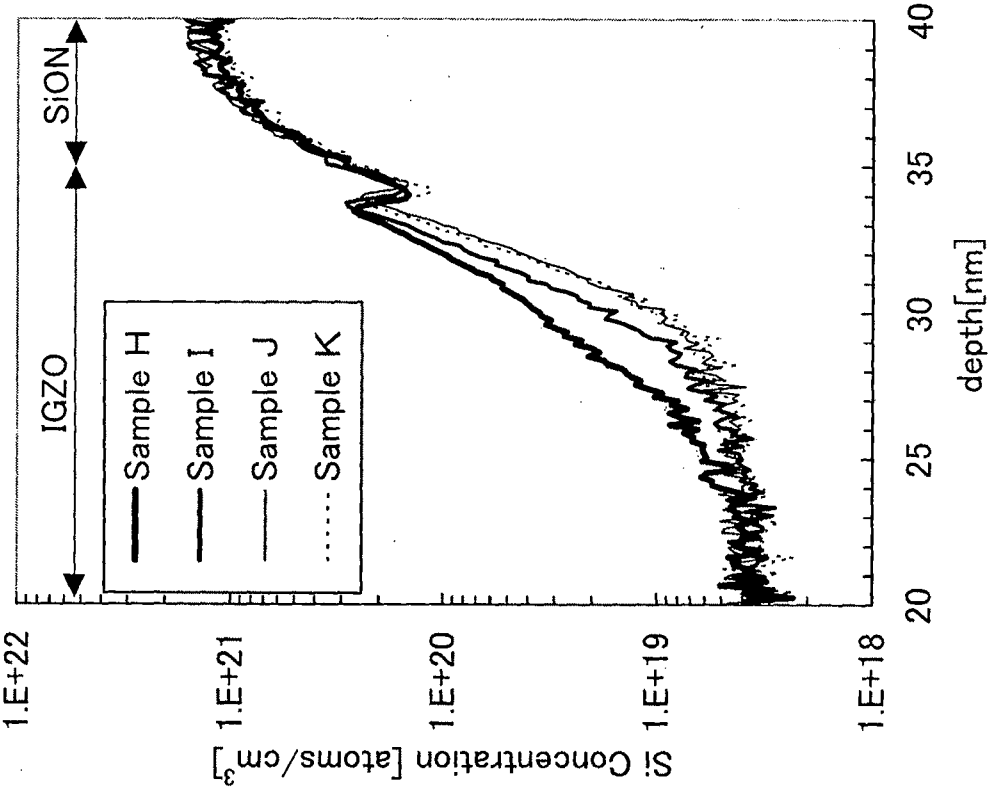


FIG. 19A

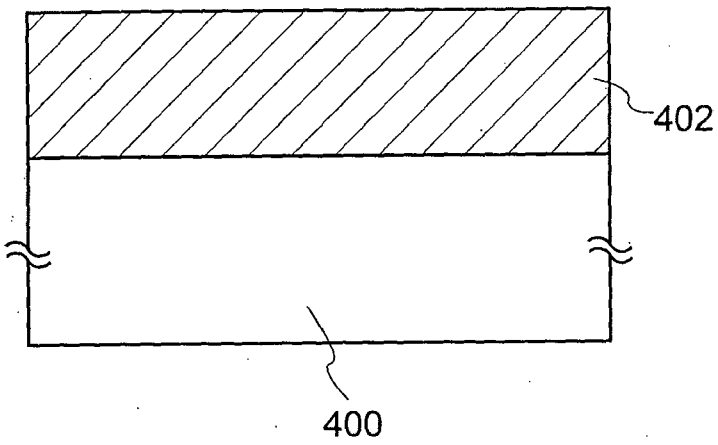


FIG. 19B

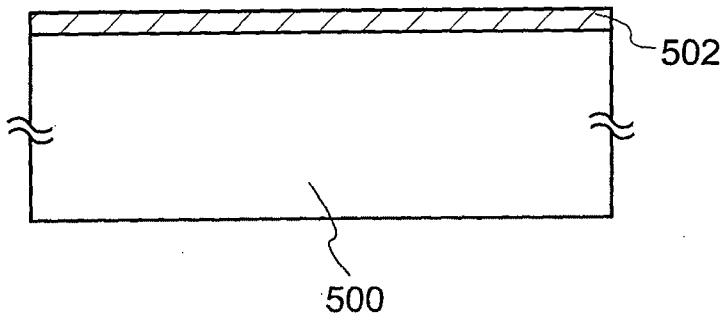


FIG. 20A

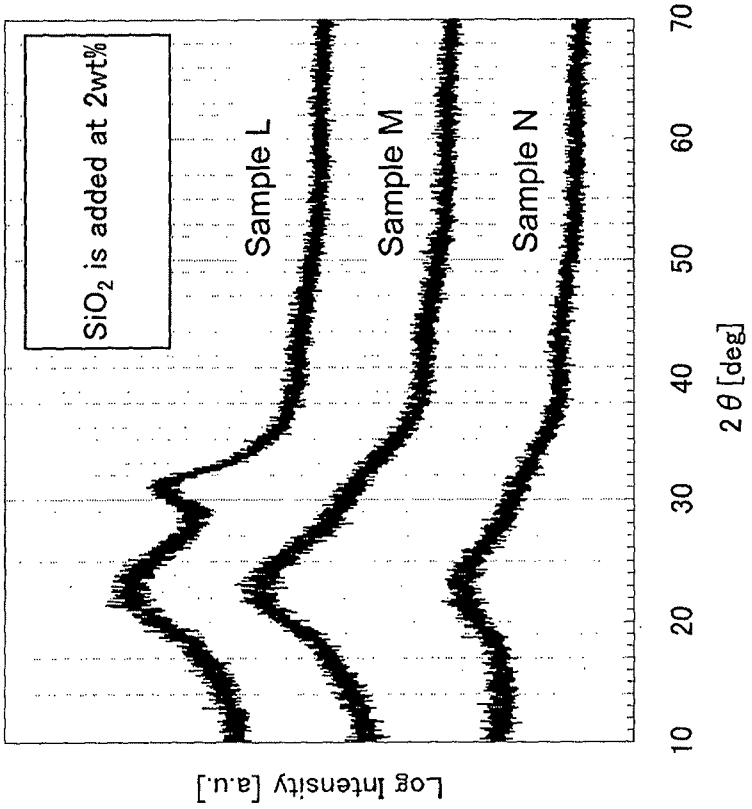


FIG. 20B

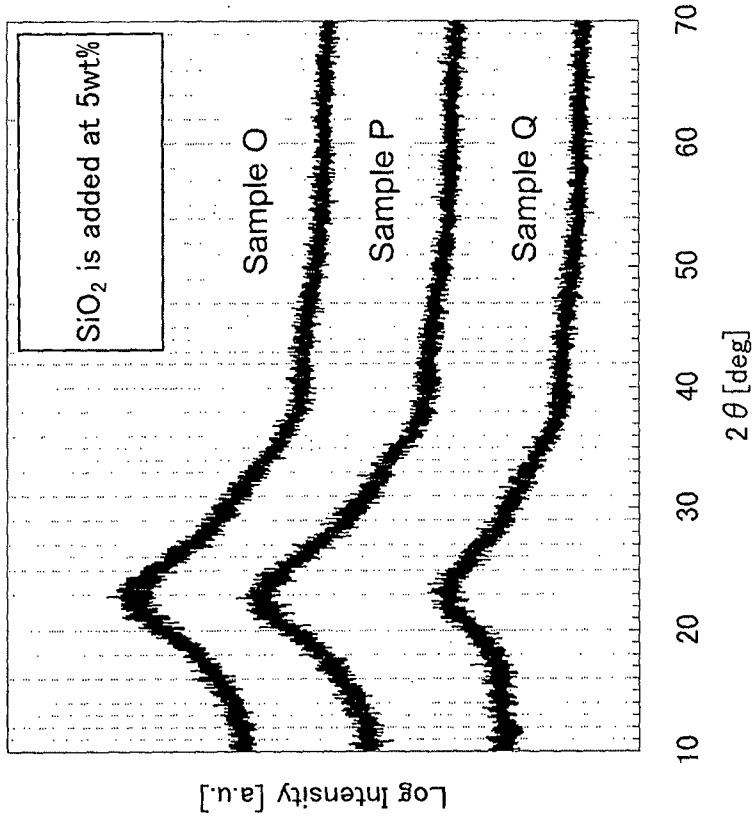


FIG. 21A

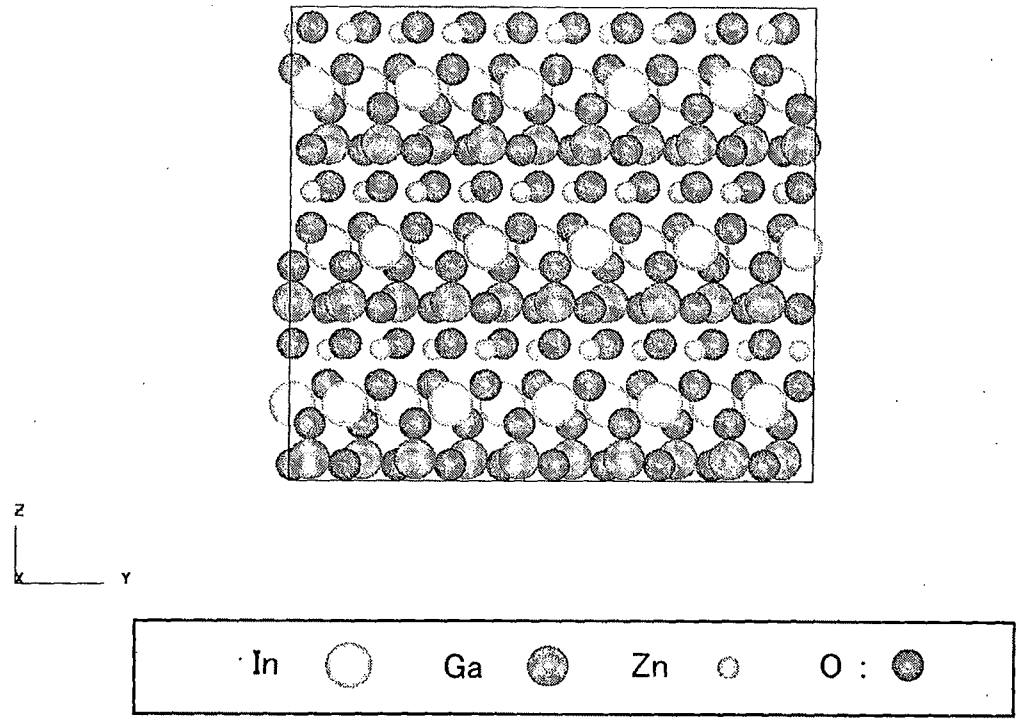


FIG. 21B

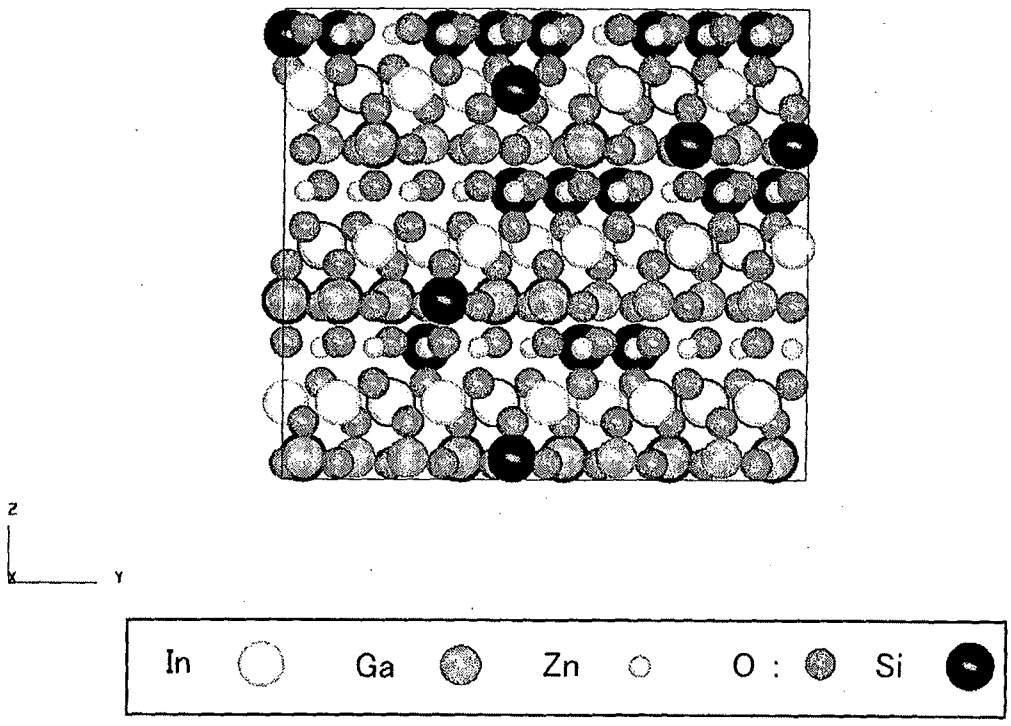


FIG. 22A

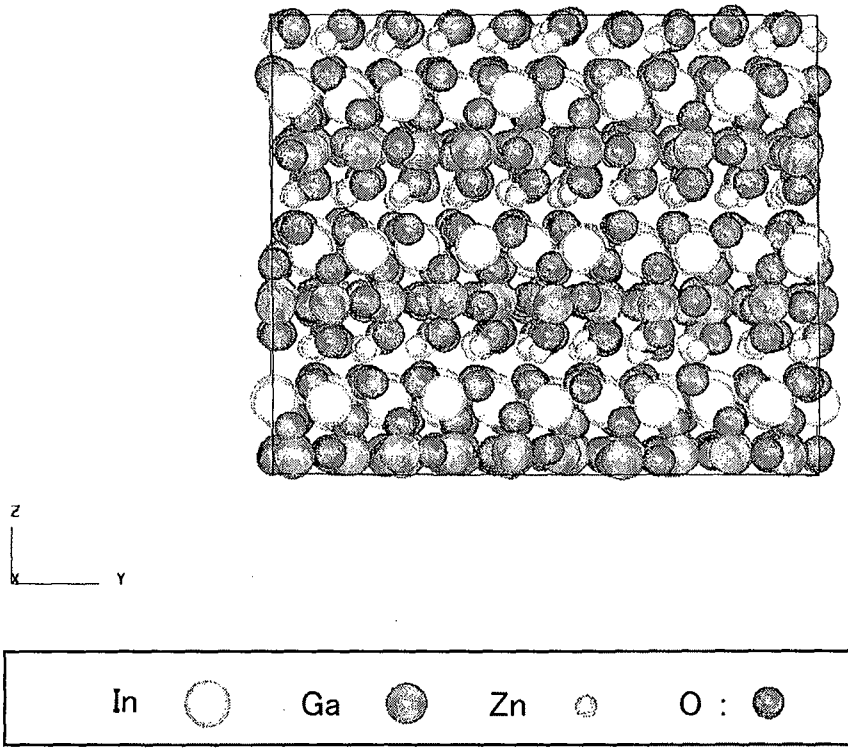


FIG. 22B

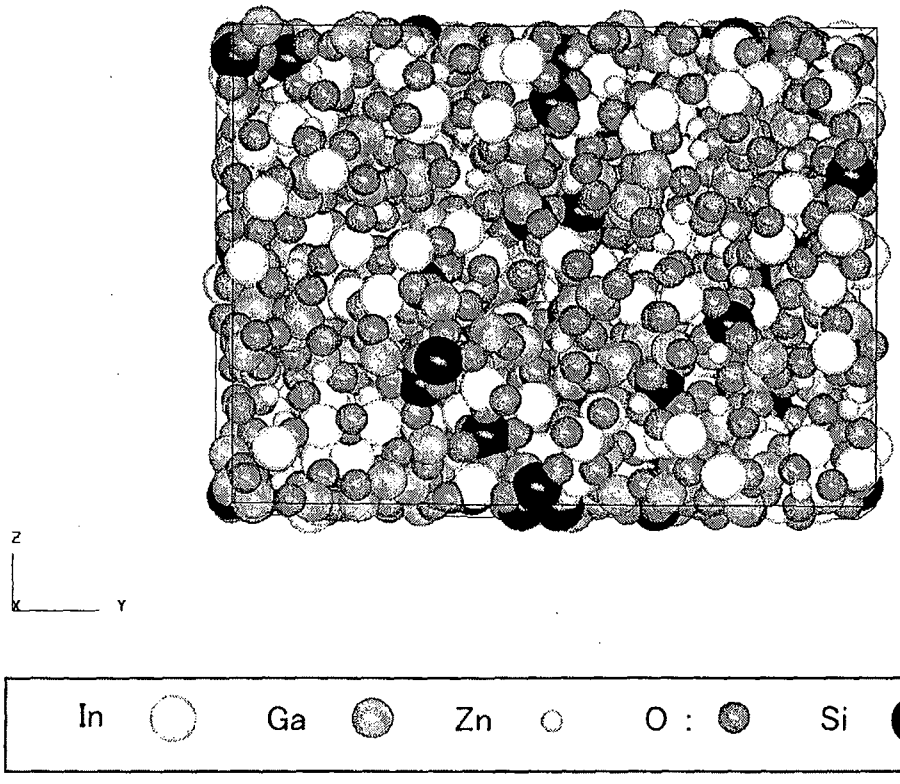


FIG. 23

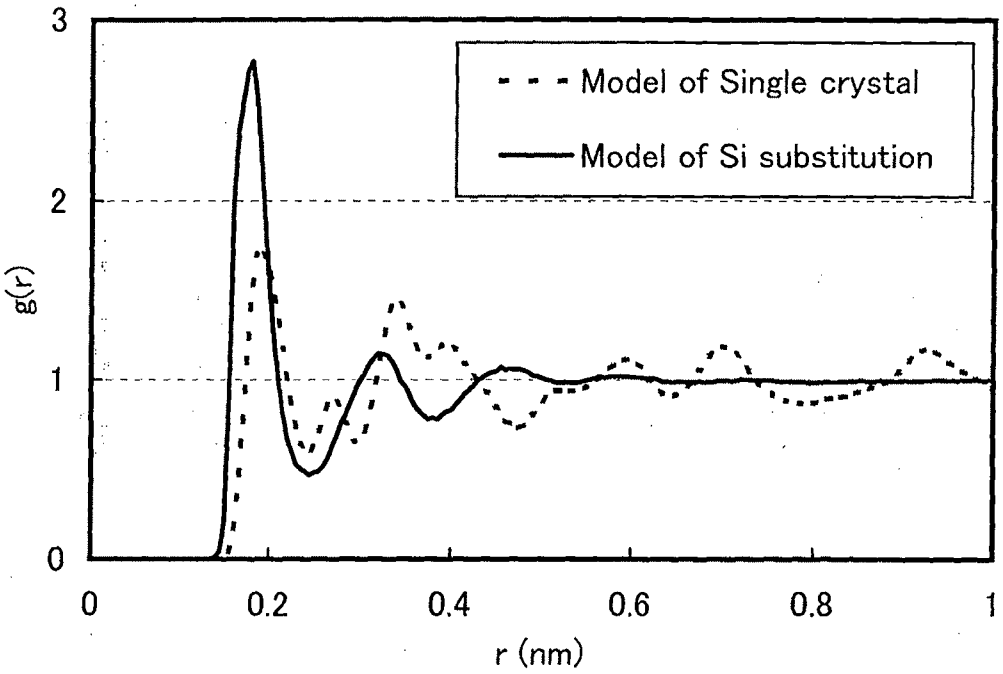

3
2
1
0
g(r)
0
0.2
0.4
0.6
0.8
1
r (nm)
Model of Single crystal
Model of Si substitution

FIG. 24A

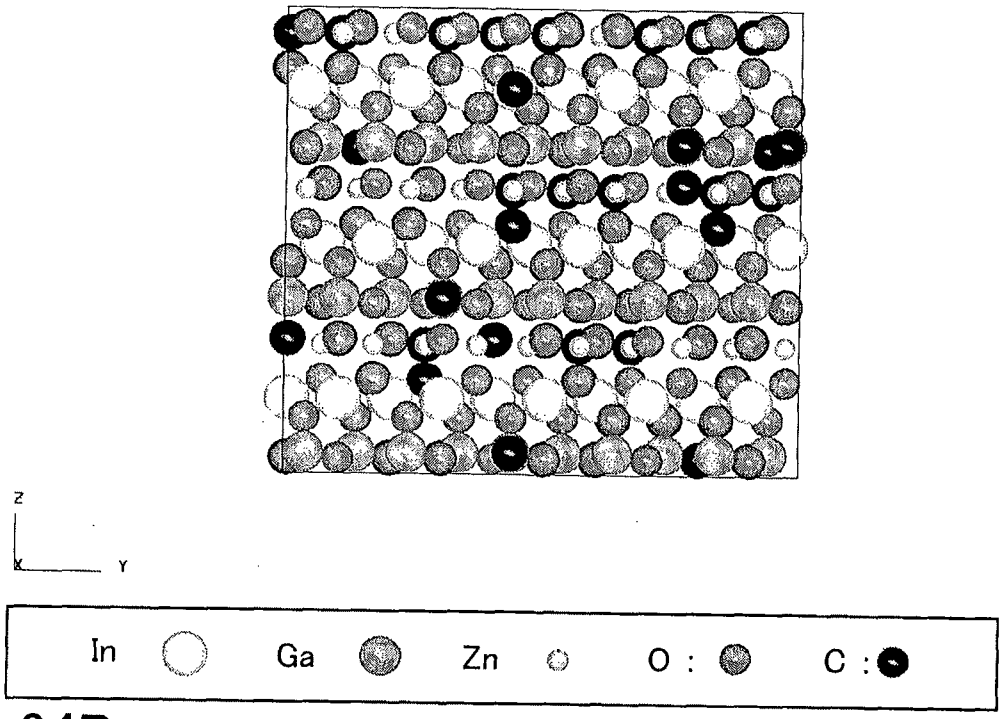


FIG. 24B

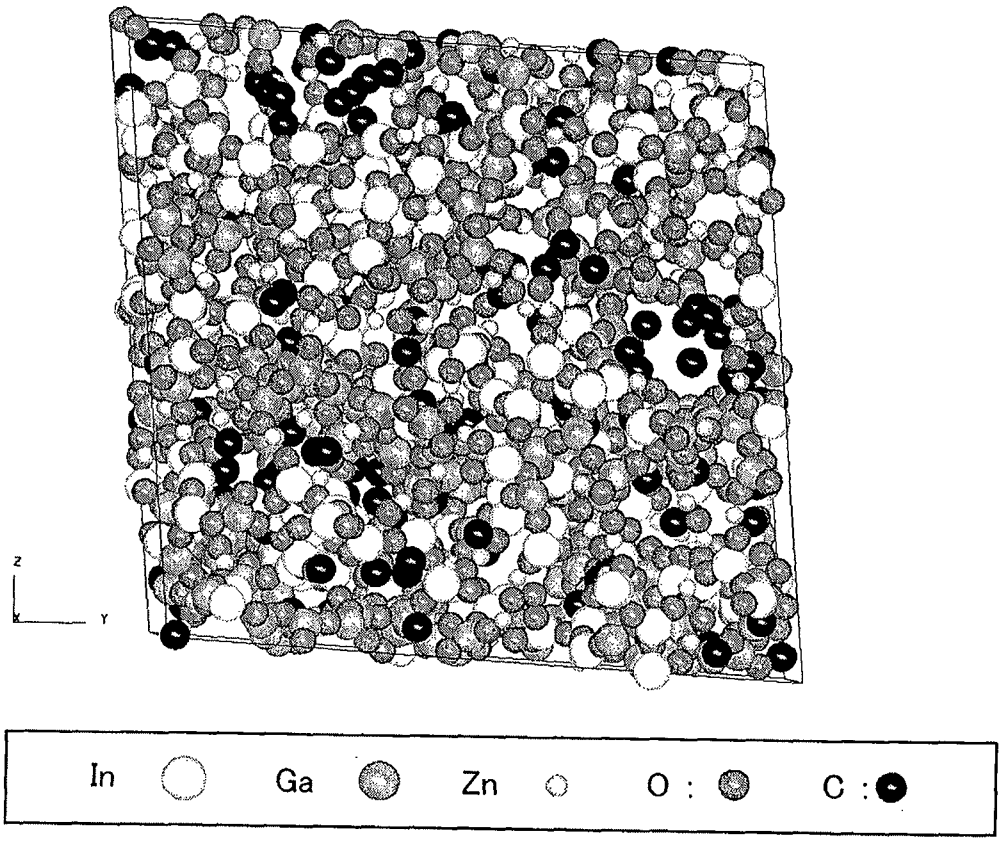
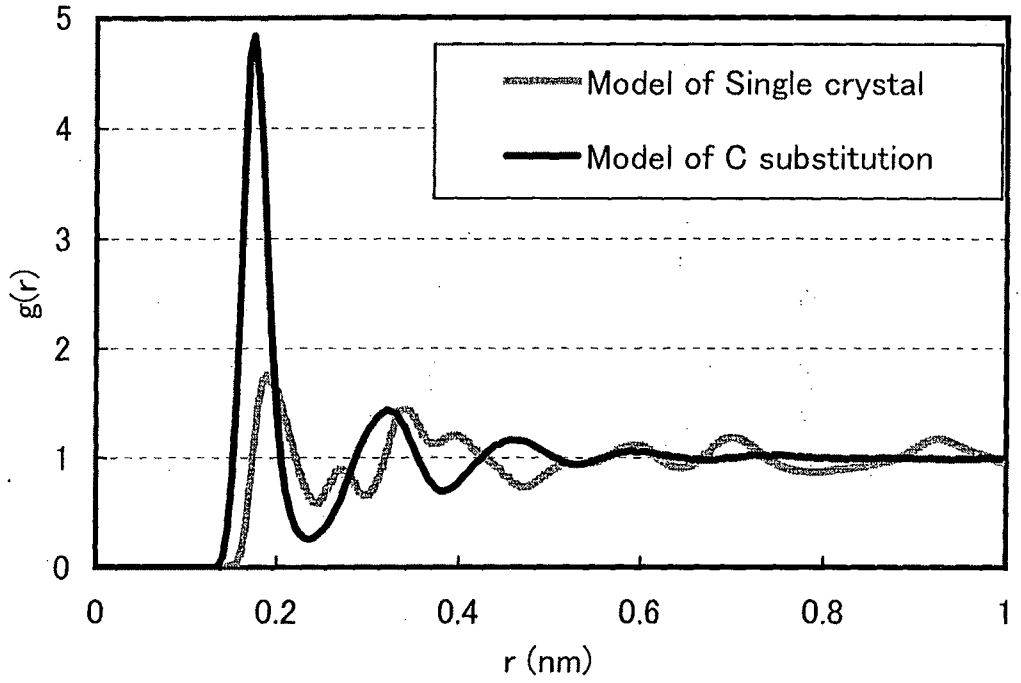


FIG. 25


Model of Single crystal
Model of C substitution
g(r)
r (nm)
0
1
2
3
4
5
0
0.2
0.4
0.6
0.8
1