FIG. 1A

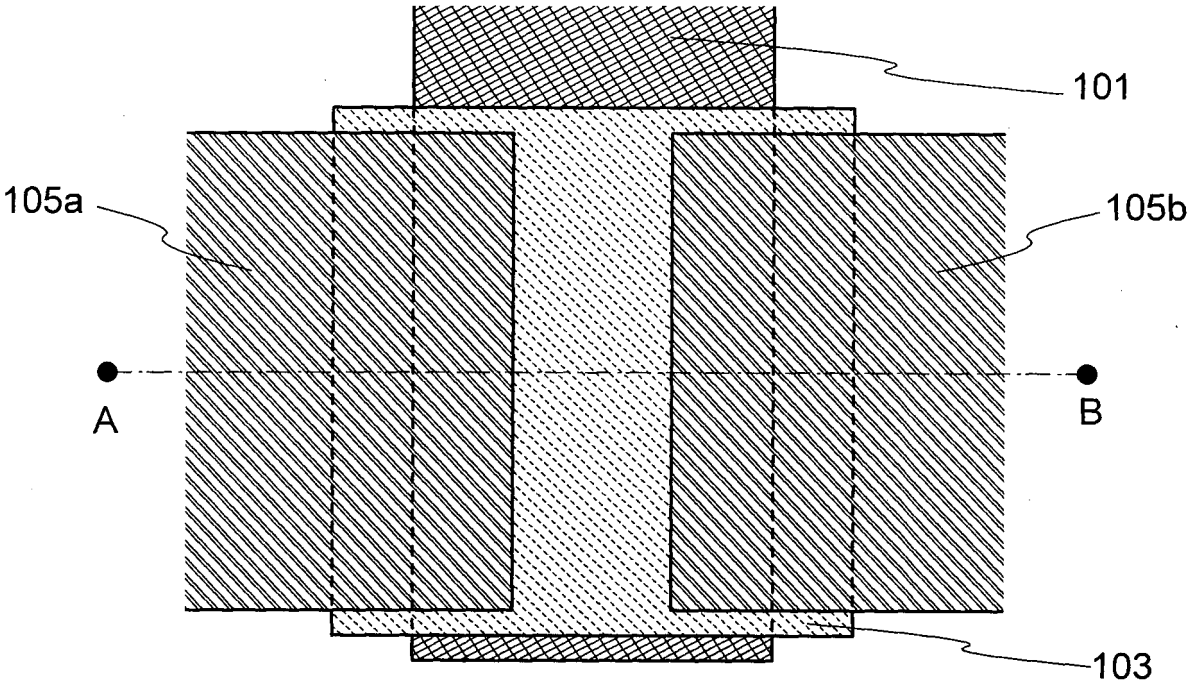

101
105a
105b
A
B
103

FIG. 1B

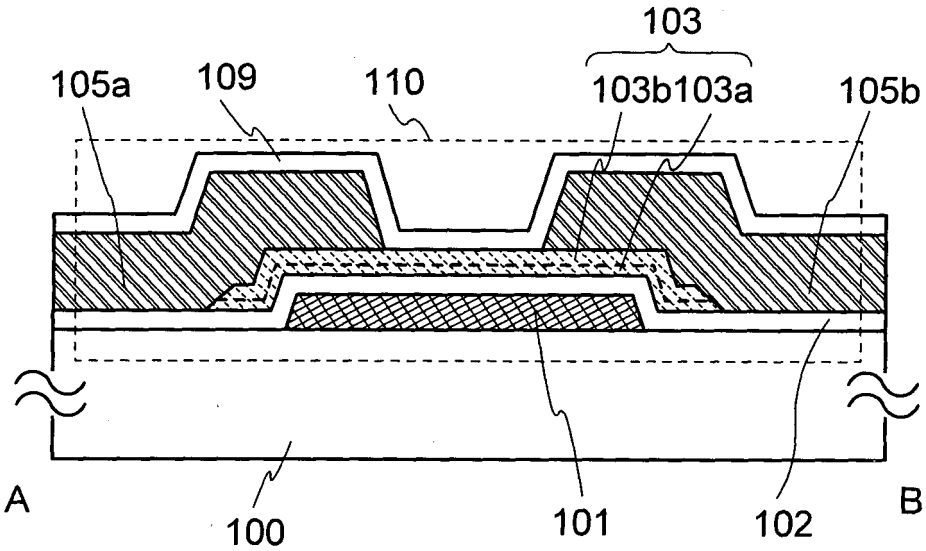

103
105a
109
110
103b103a
105b
A
100
101
102
B

FIG. 2A

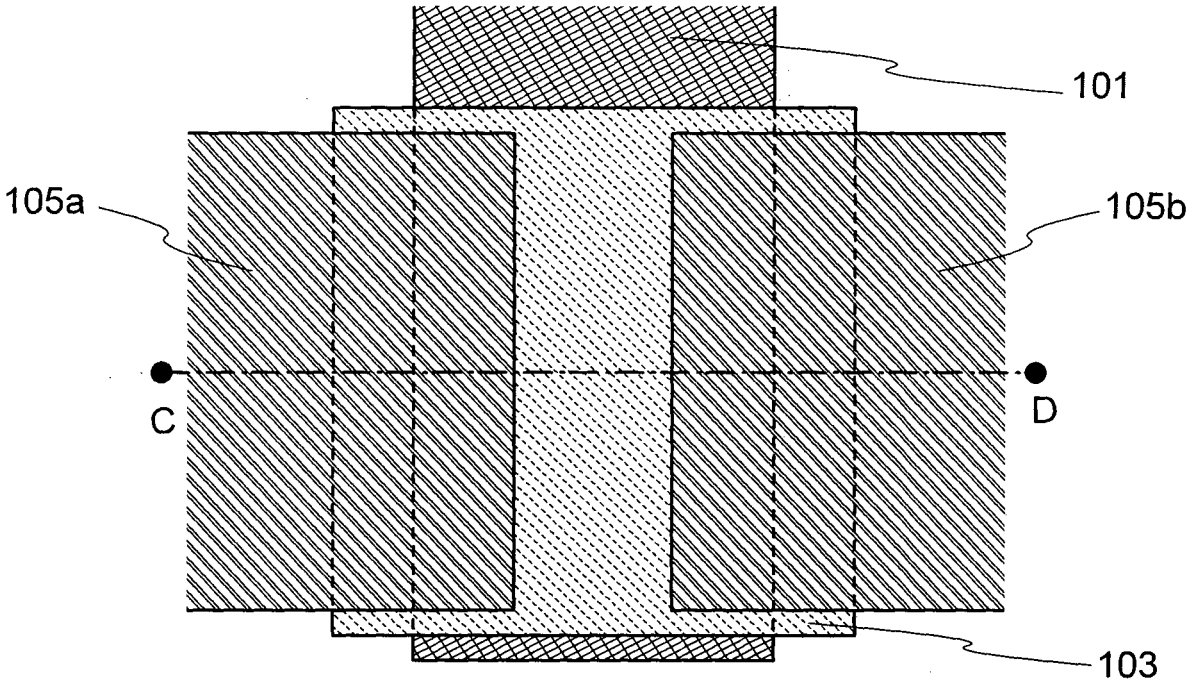

101
105a
105b
C
D
103

FIG. 2B

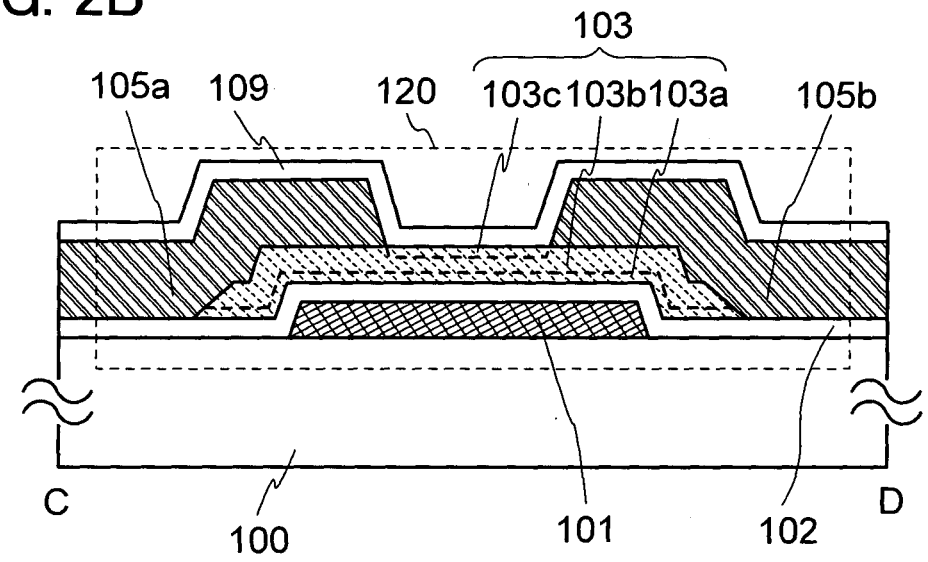

103
105a
109
120
103c
103b
103a
105b
C
D
100
101
102

FIG. 3A

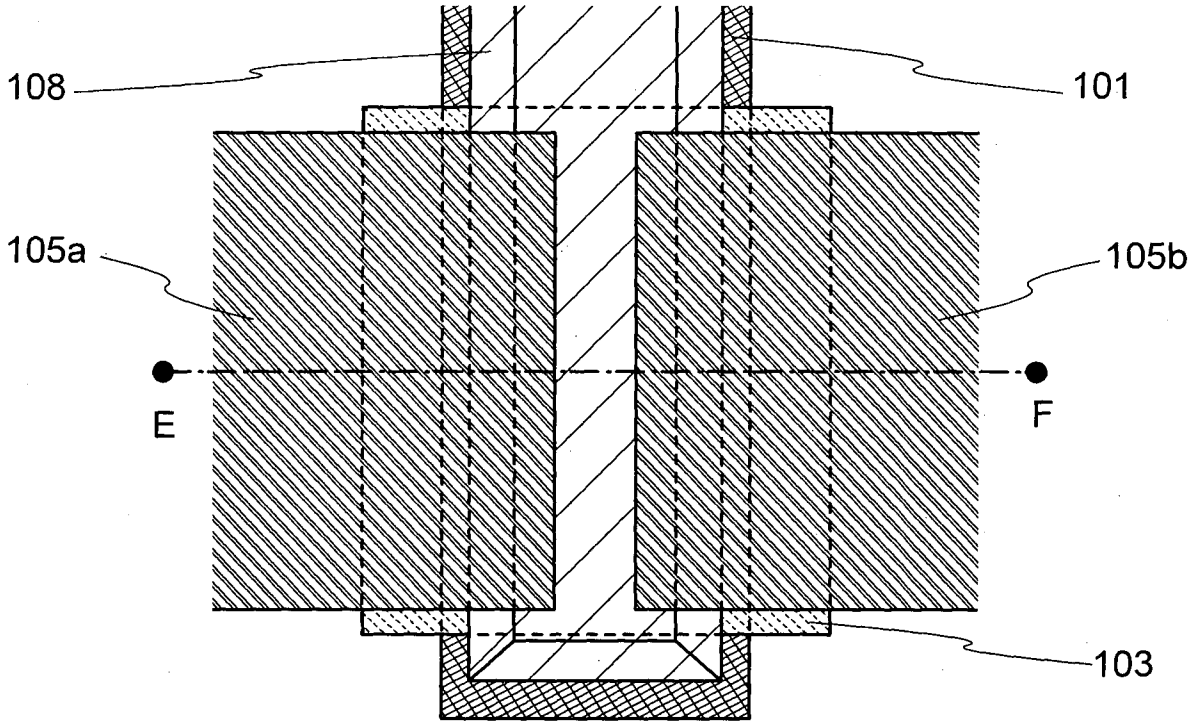

108
101
105a
105b
E
F
103

FIG. 3B

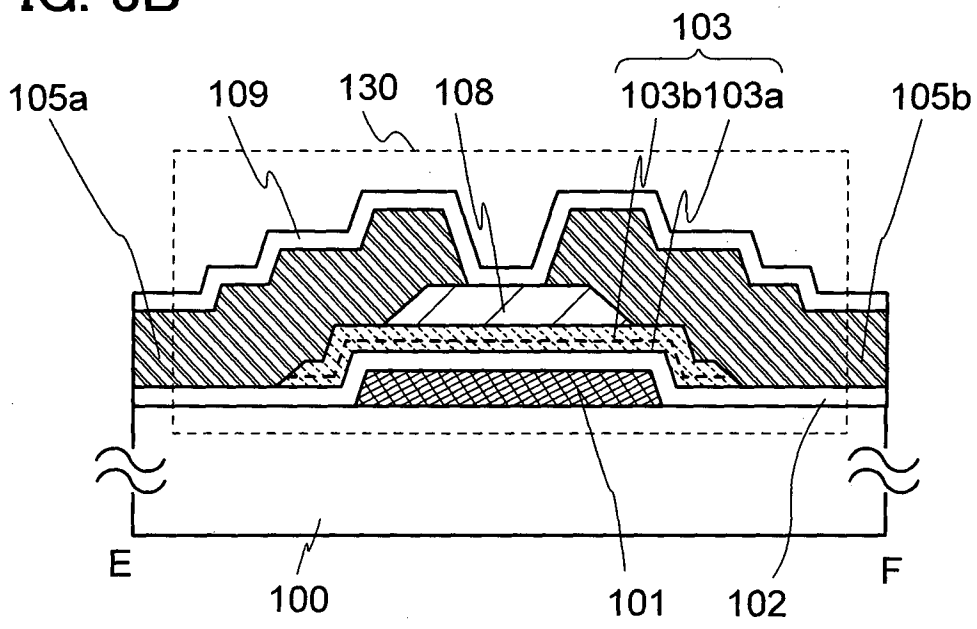

103
105a
109
130
108
103b103a
105b
E
100
101
102
F

FIG. 4A

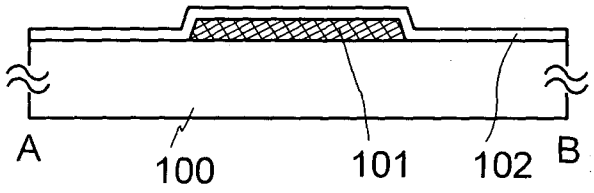



FIG. 4B

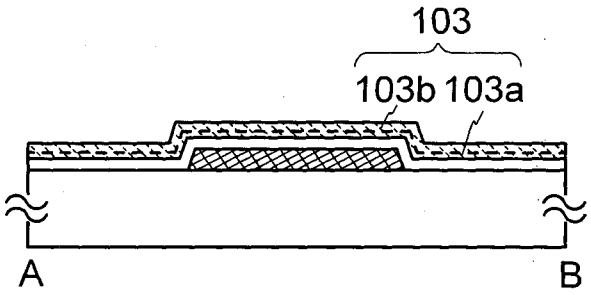



FIG. 4C

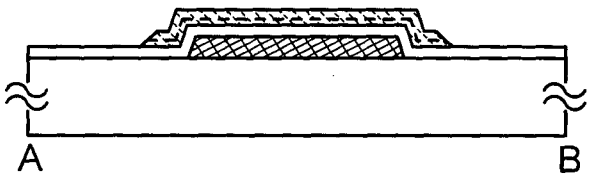



FIG. 4D

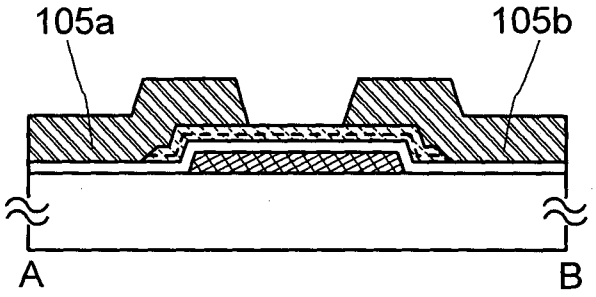



FIG. 4E

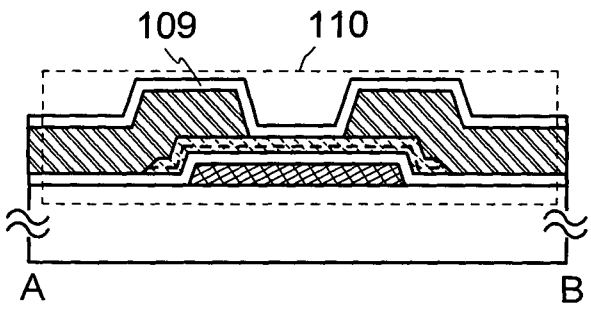


FIG. 5A

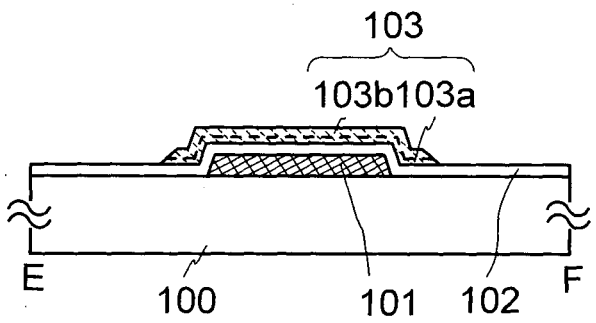



FIG. 5B

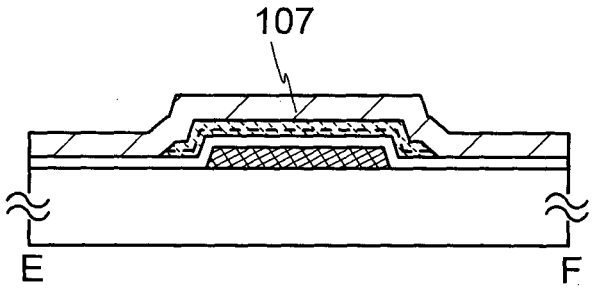



FIG. 5C

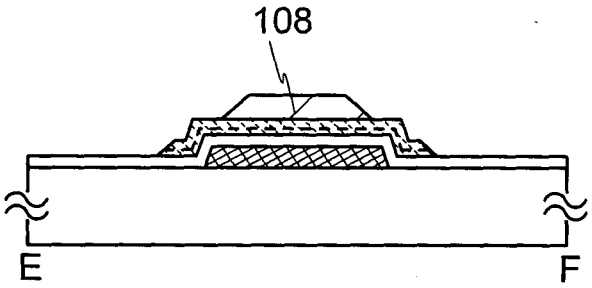



FIG. 5D

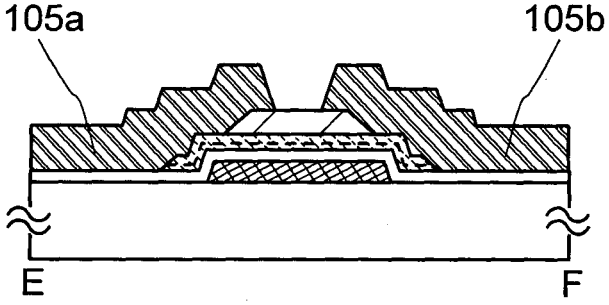



FIG. 5E

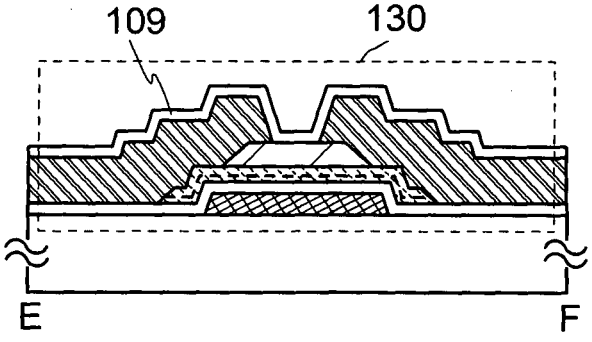
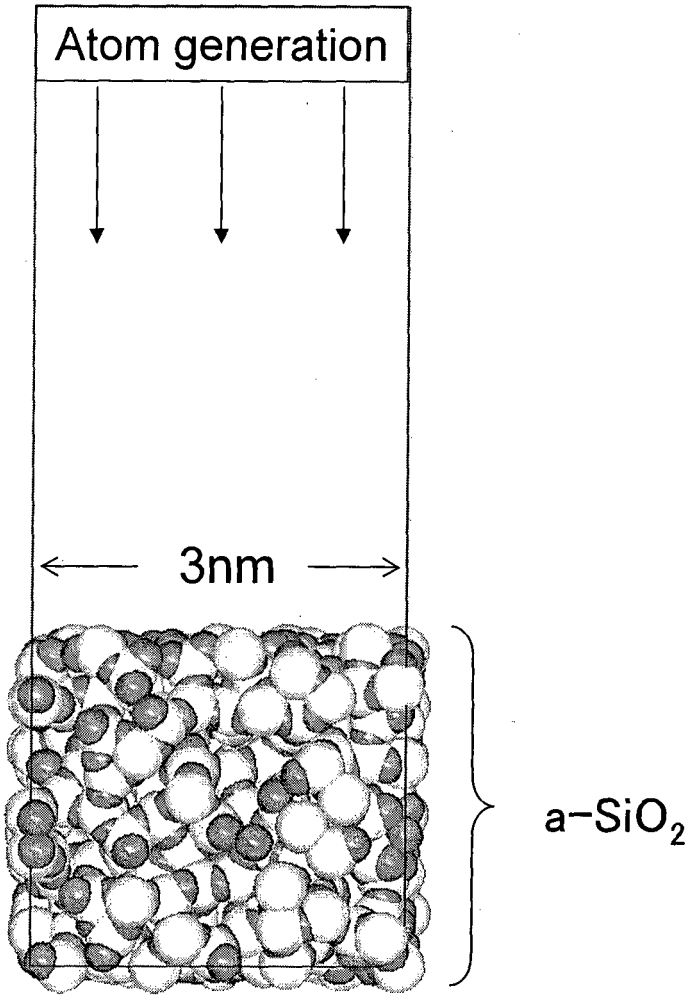
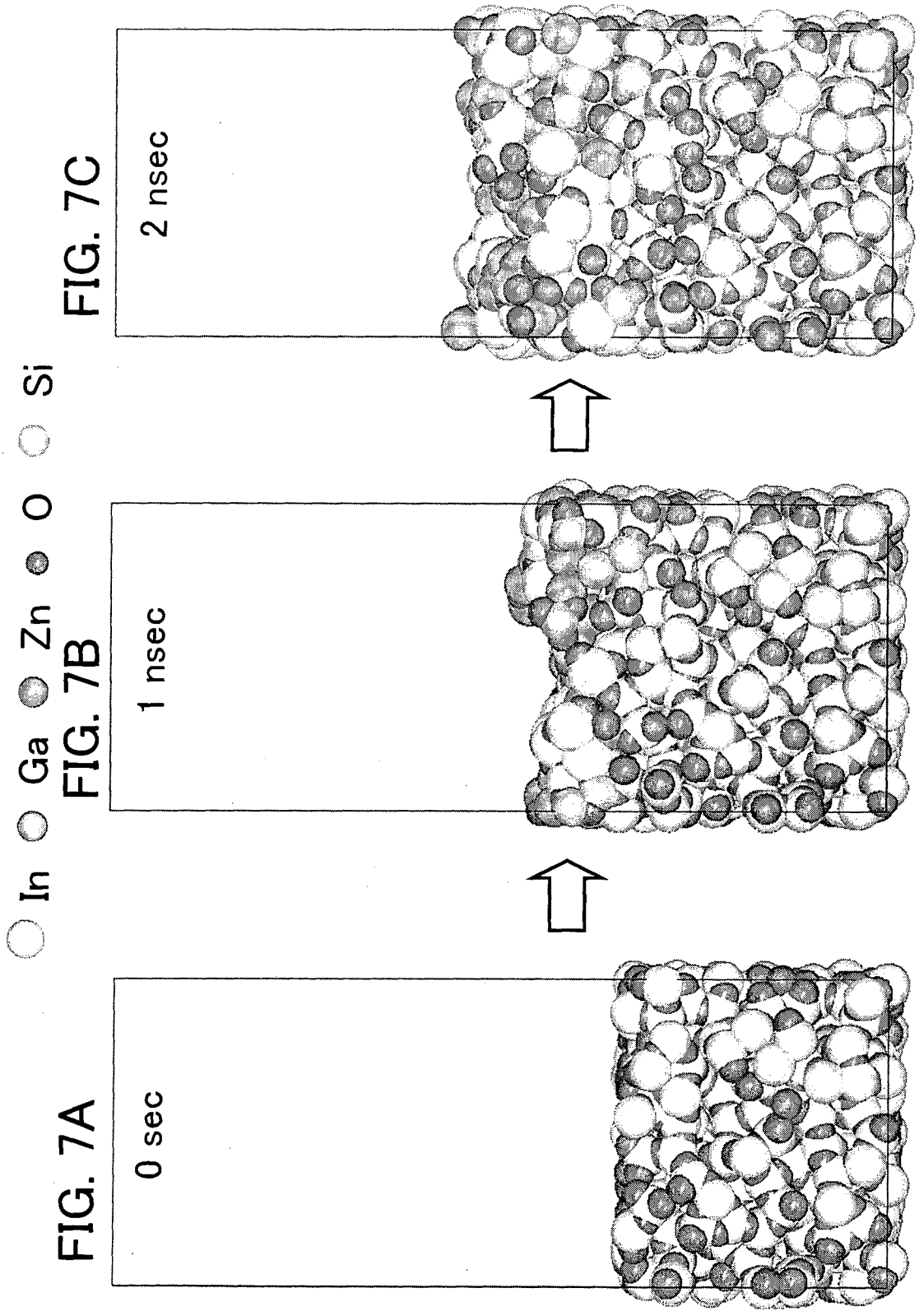


FIG. 6




In
Ga
Zn
O
Si
FIG. 7A
0 sec
FIG. 7B
1 nsec
FIG. 7C
2 nsec

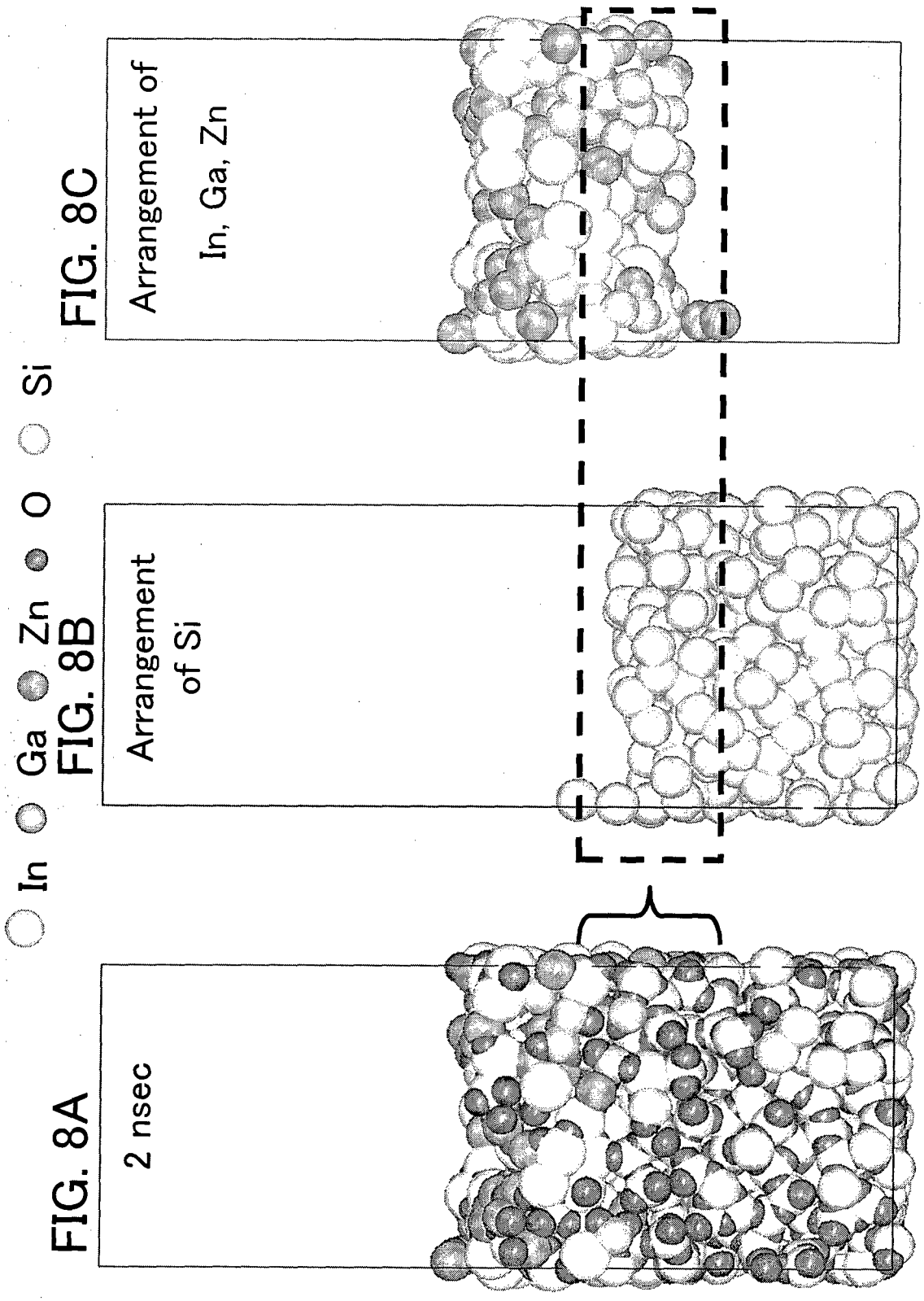

FIG. 8A
2 nsec
FIG. 8B
Arrangement of Si
FIG. 8C
Arrangement of In, Ga, Zn
In
Ga
Zn
O
Si

FIG. 9A

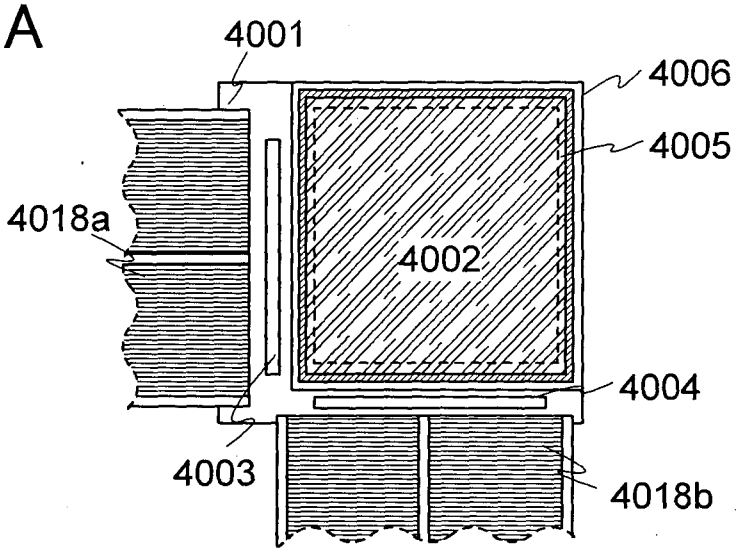



FIG. 9B

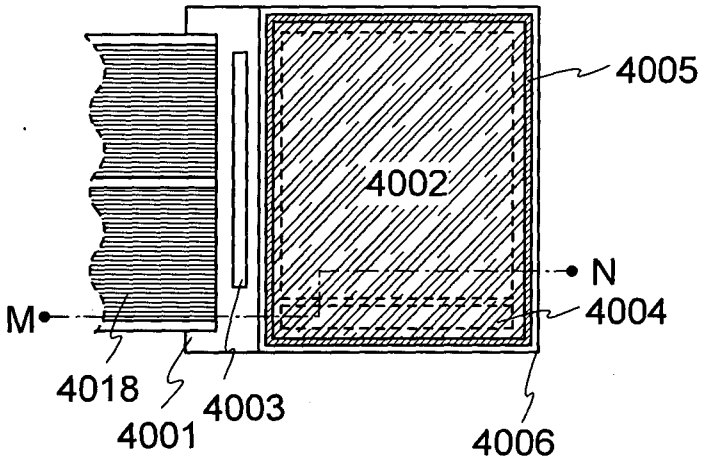
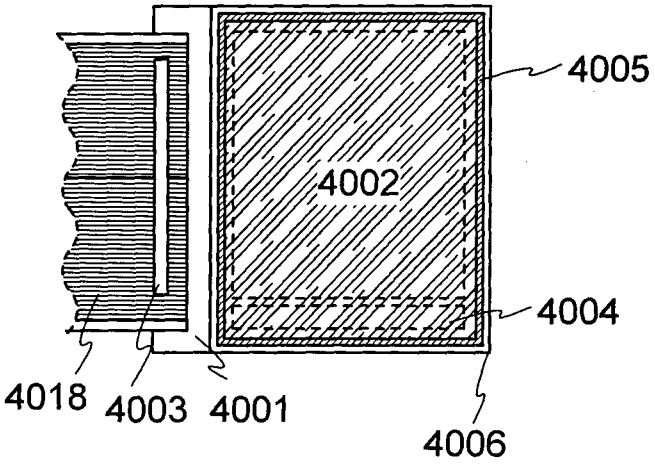



FIG. 9C



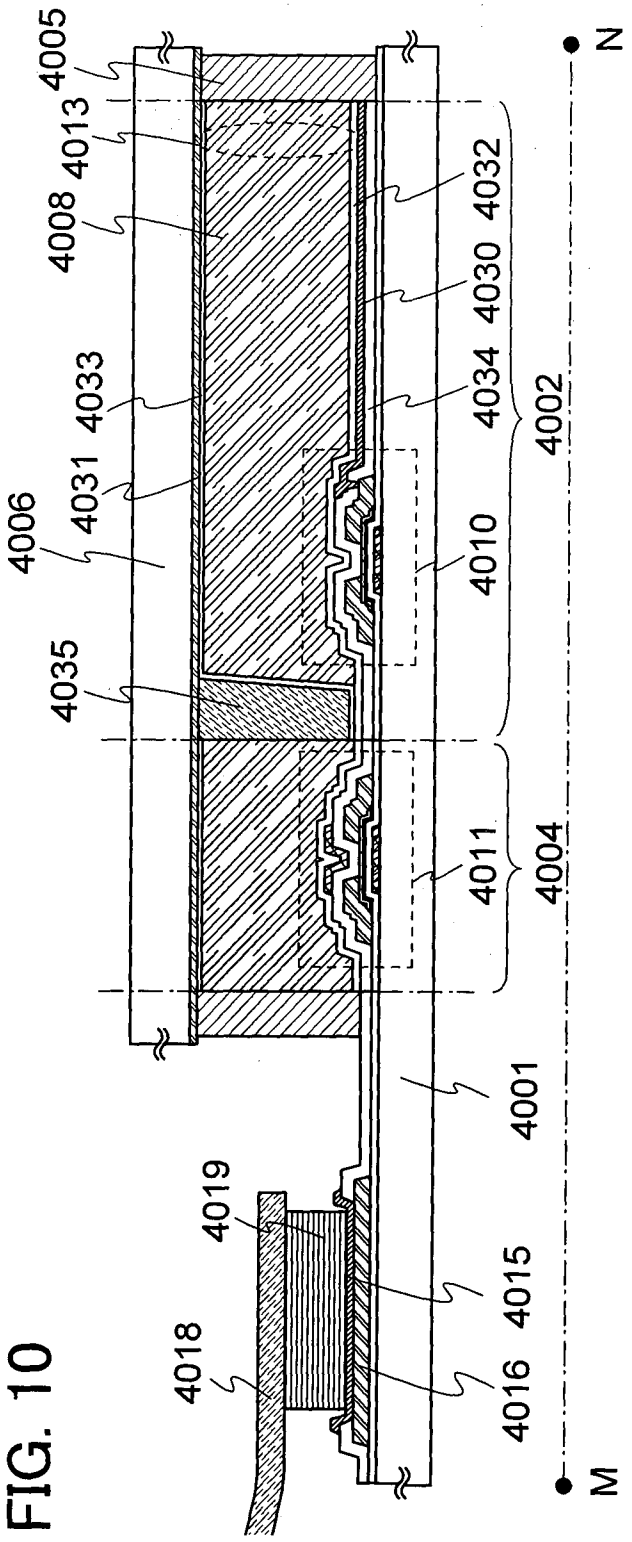

4005
4013
4008
4032
4030
4033
4034
4002
4031
4006
4010
4035
4011
4004
4001
4019
4015
4018
4016
N
M

FIG. 10

FIG. 11

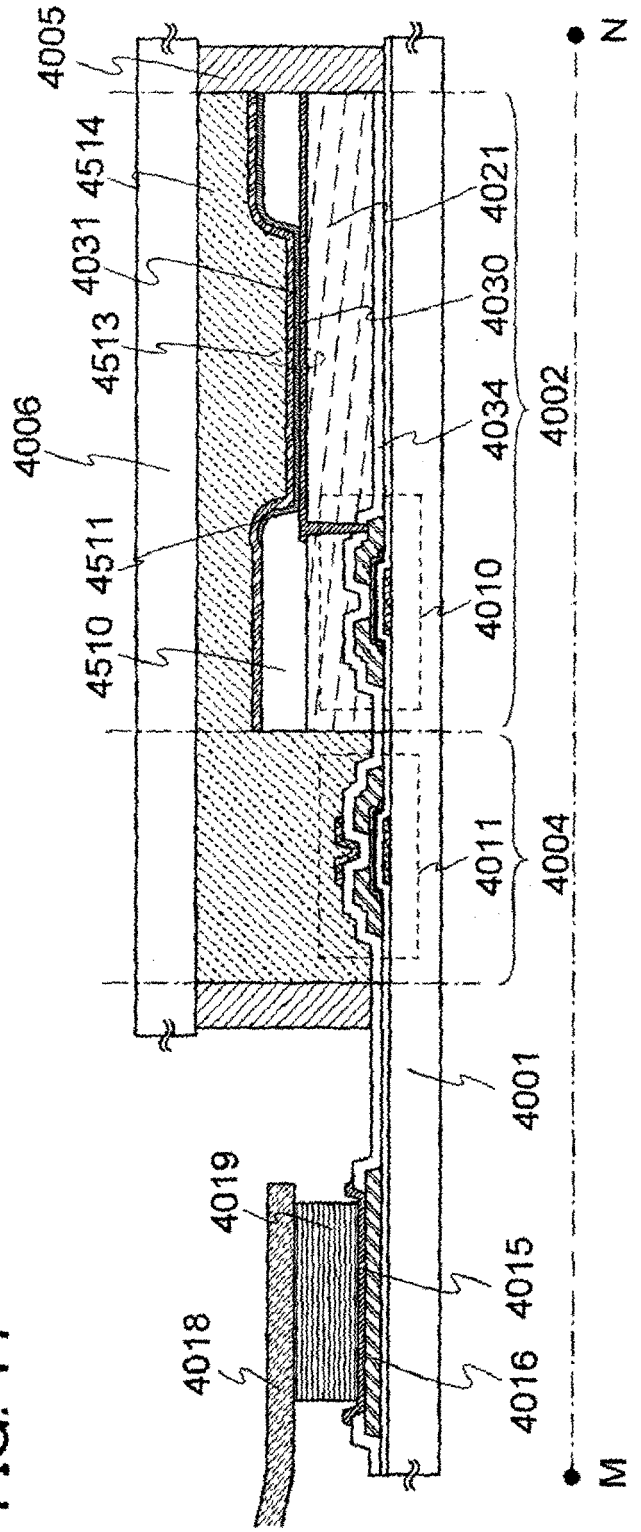

4005
4514
4031
4513
4006
4511
4510
4021
4030
4034
4002
4010
4011
4004
4001
4019
4015
4018
4016
N
M

FIG. 12

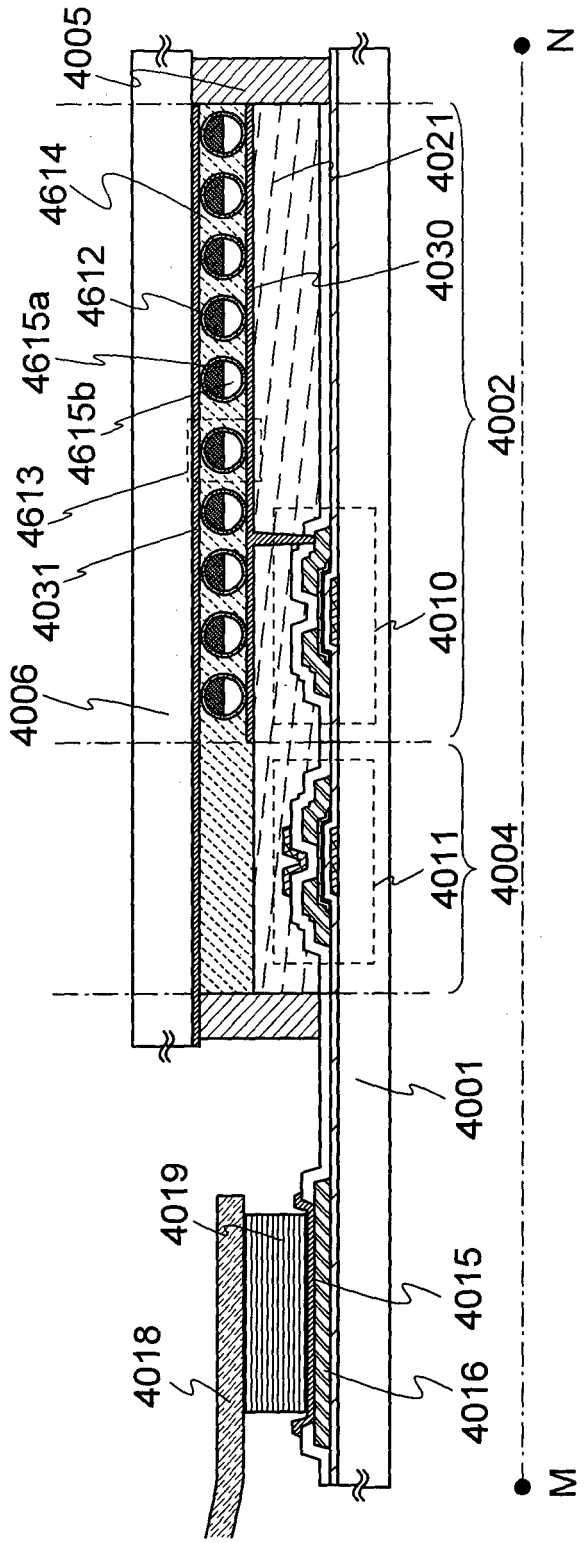

4005
4614
4612
4615a
4615b
4613
4031
4006
4021
4030
4002
4010
4011
4004
4001
4019
4015
4018
4016
N
M

FIG. 13A

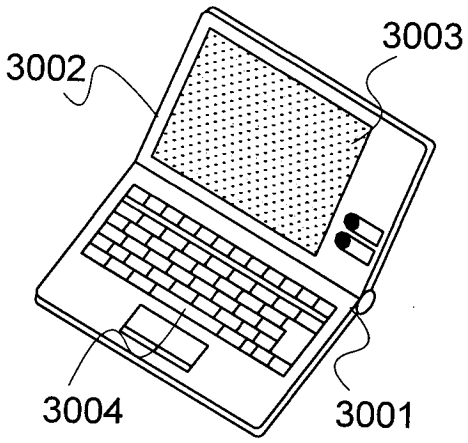



FIG. 13B

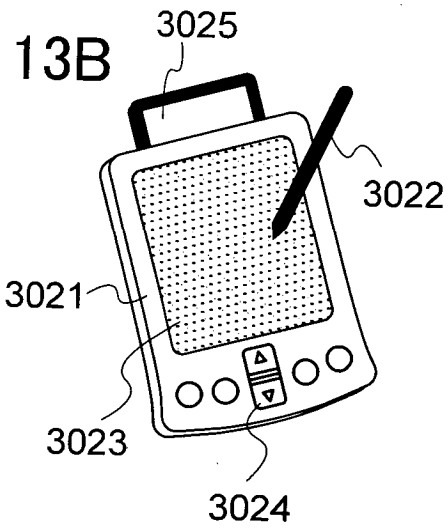



FIG. 13C

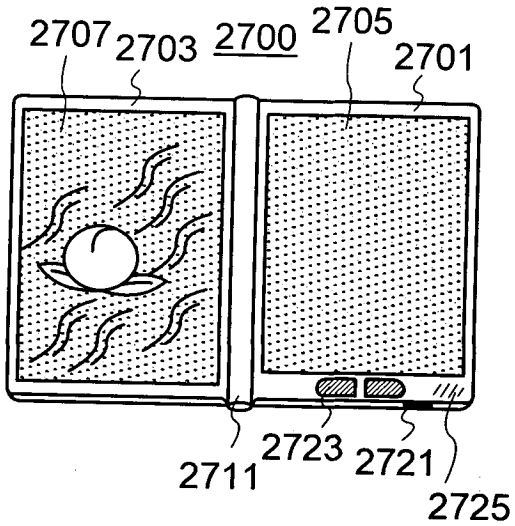



FIG. 13D

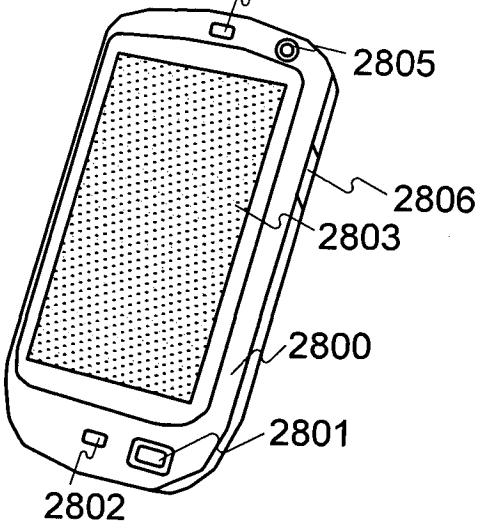



FIG. 13E

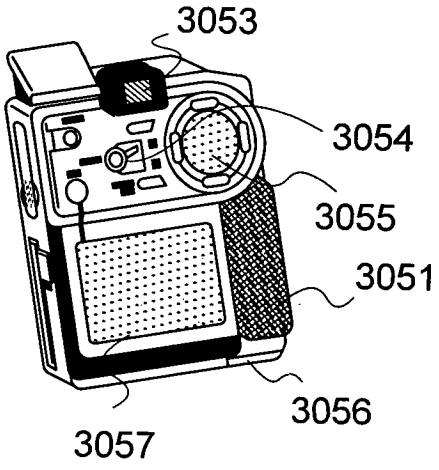



FIG. 13F

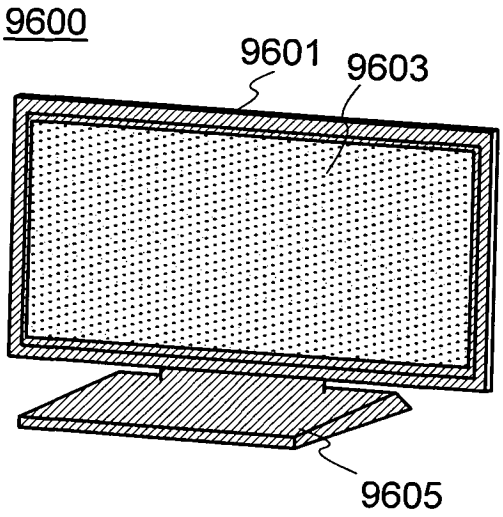


FIG. 14

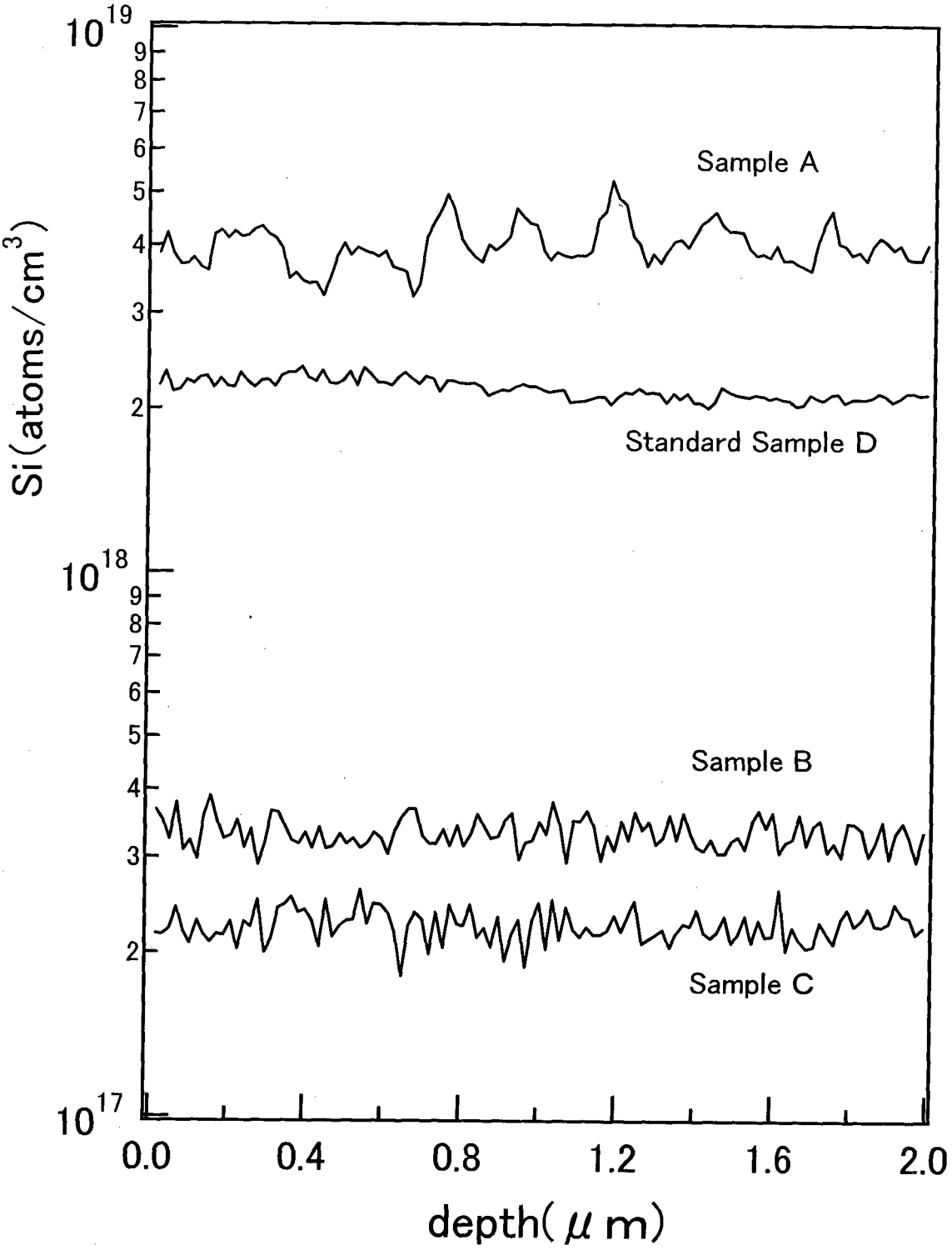

Si(atoms/cm3)
10^19
9
8
7
6
5
4
3
2
Sample A
Standard Sample D
10^18
9
8
7
6
5
4
3
2
Sample B
Sample C
10^17
0.0
0.4
0.8
1.2
1.6
2.0
depth(μm)

FIG. 15

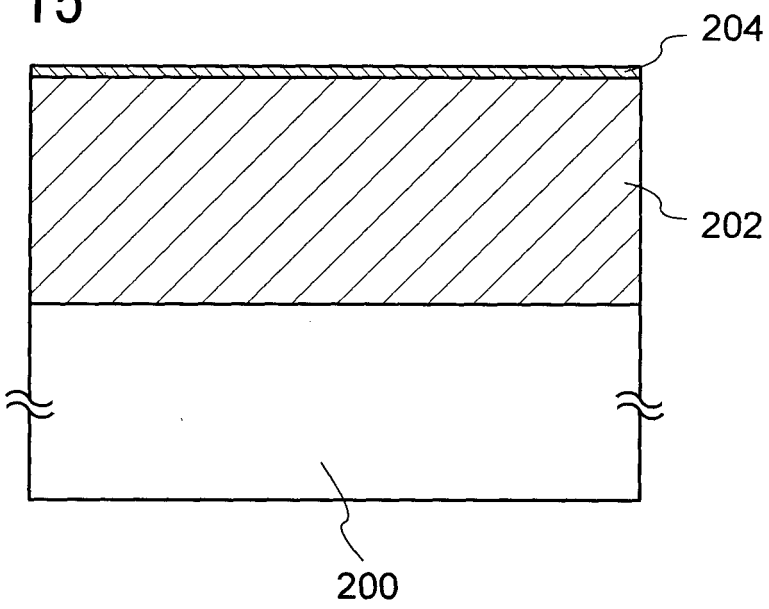


FIG. 16

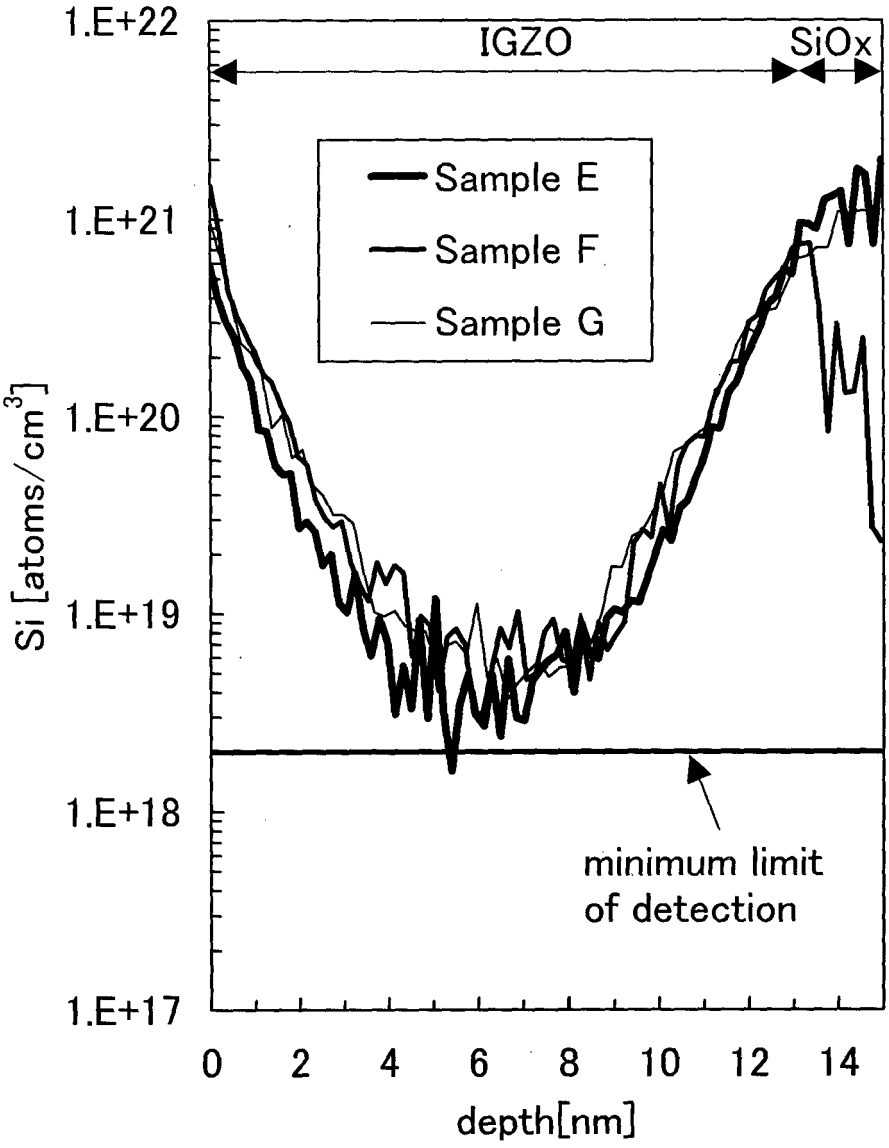

IGZO
SiOx
Sample E
Sample F
Sample G
1.E+22
1.E+21
1.E+20
1.E+19
1.E+18
1.E+17
Si [atoms/cm3]
minimum limit
of detection
0
2
4
6
8
10
12
14
depth[nm]

FIG. 17

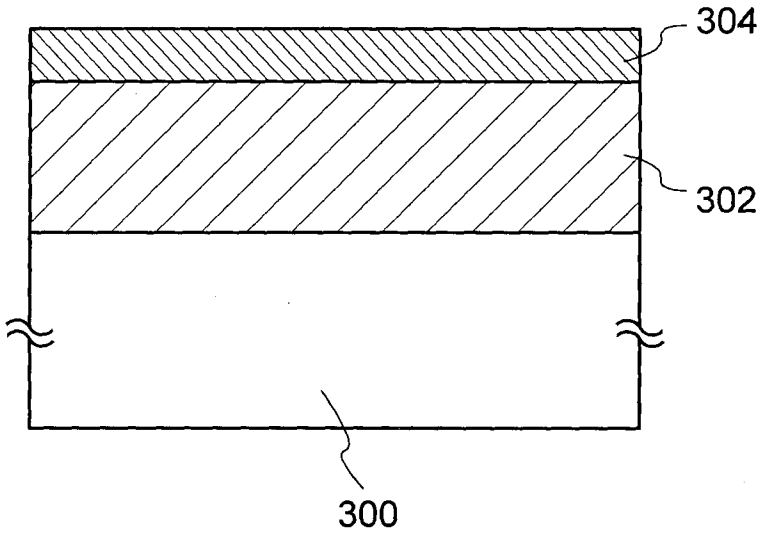


FIG. 18A

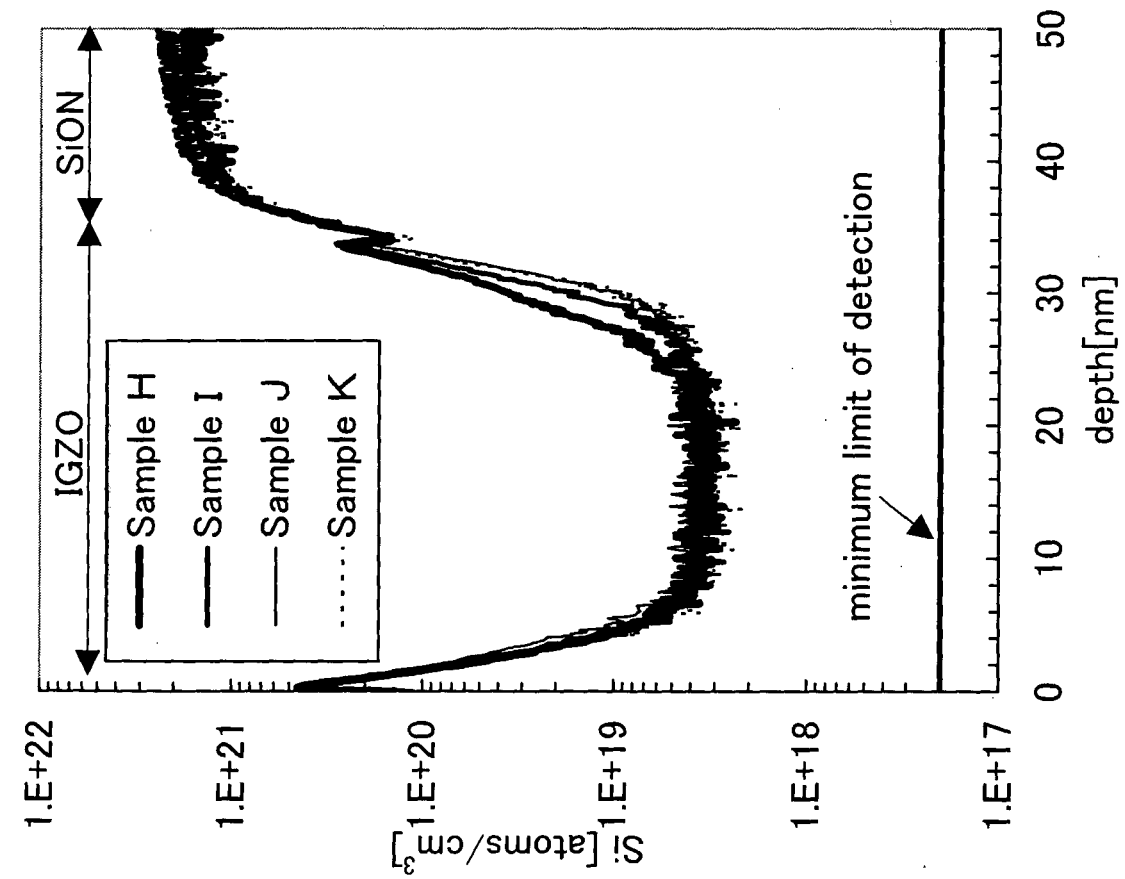



FIG. 18B

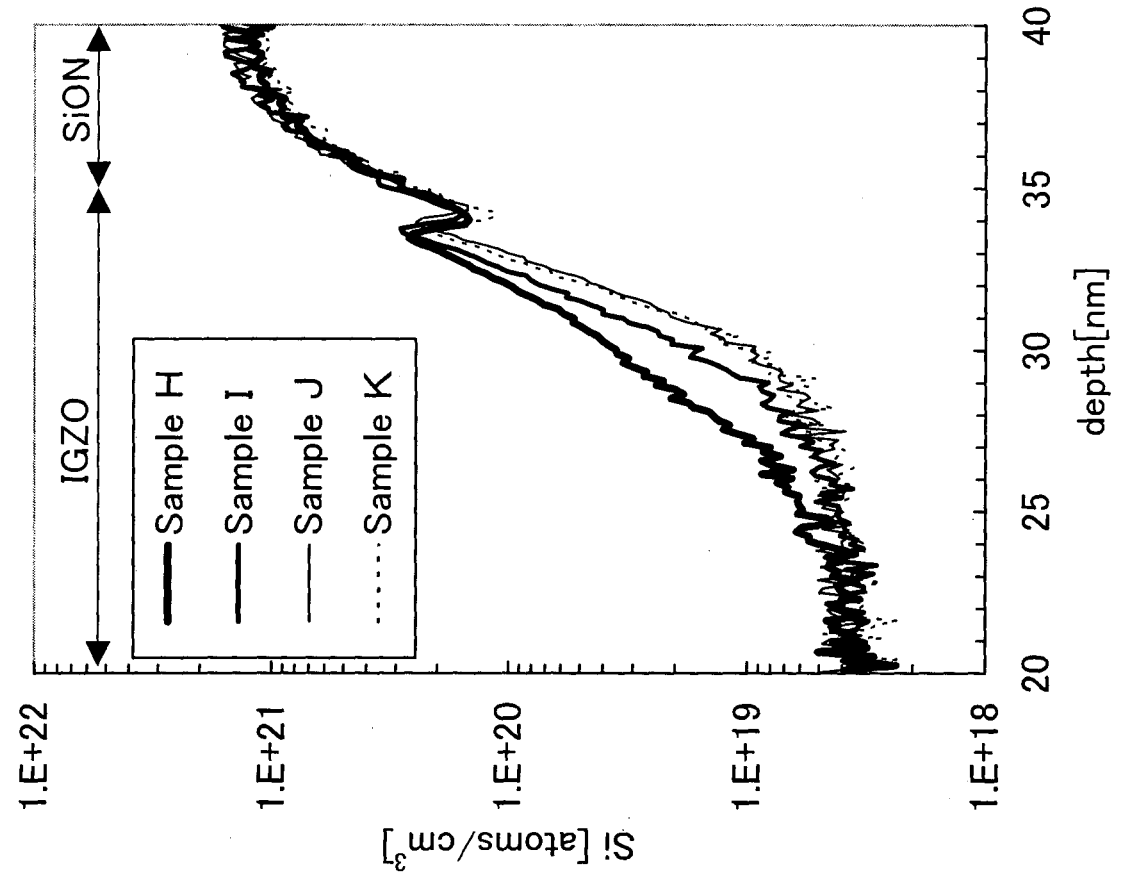
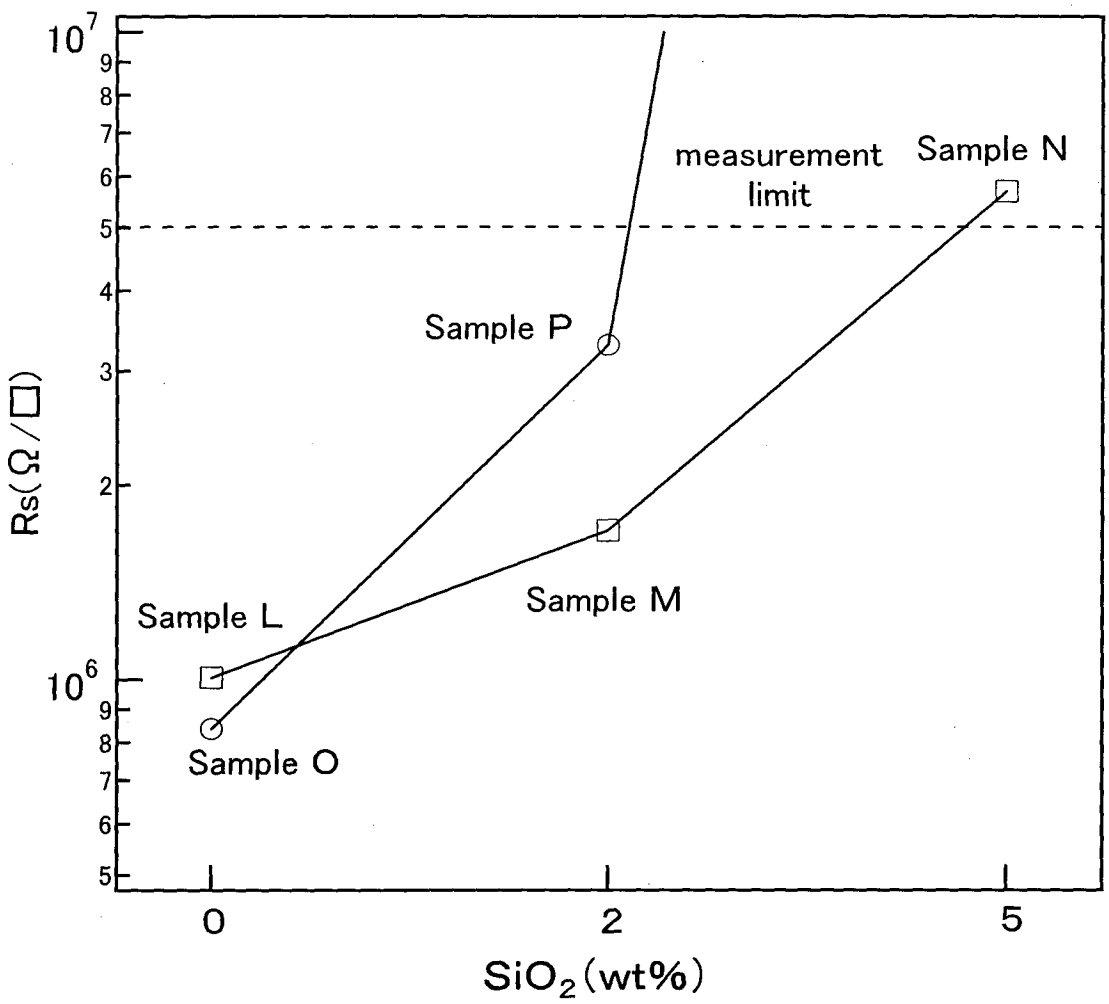


FIG. 19


$10^7$
9
8
7
6
5
4
3
2
$10^6$
9
8
7
6
5
Rs(Ω/□)
measurement limit
Sample N
Sample P
Sample M
Sample L
Sample O
0
2
5
$SiO_2$(wt%)