

FIG. 1

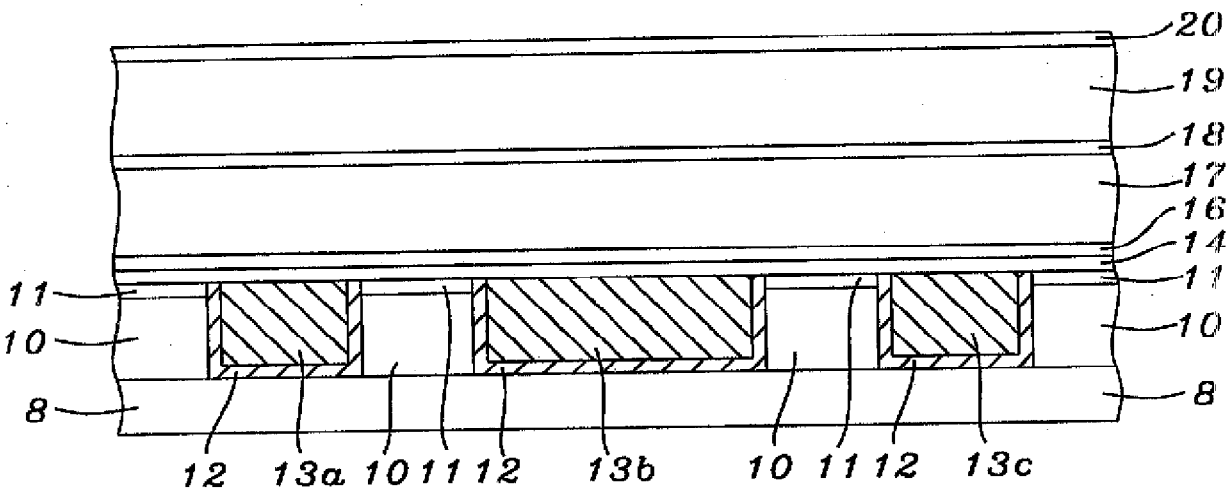


FIG. 2

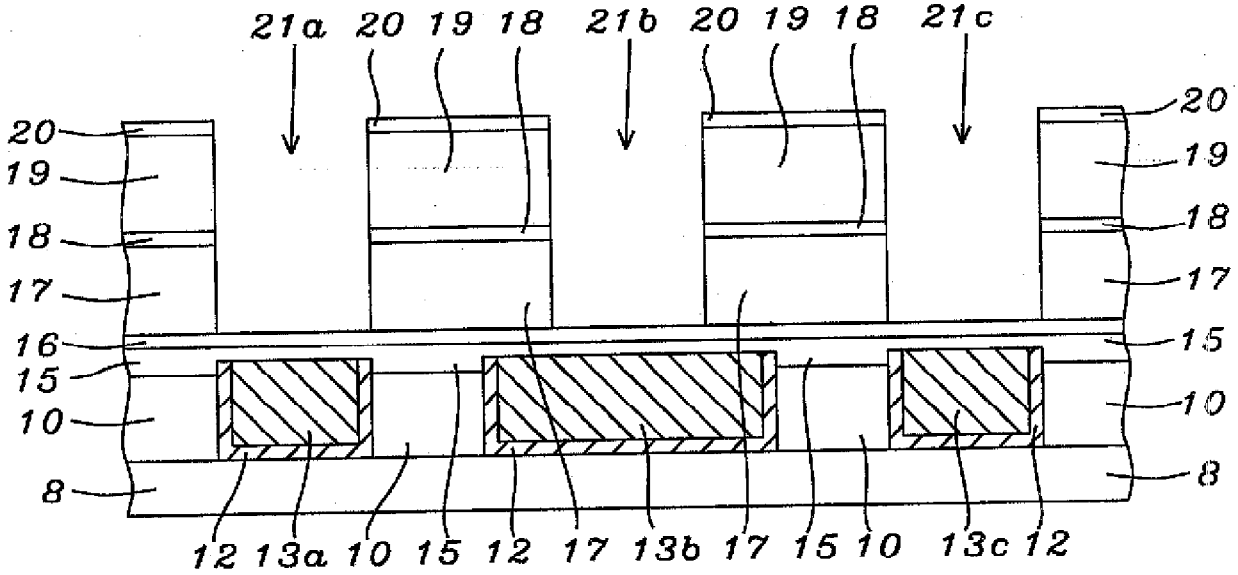


FIG. 3

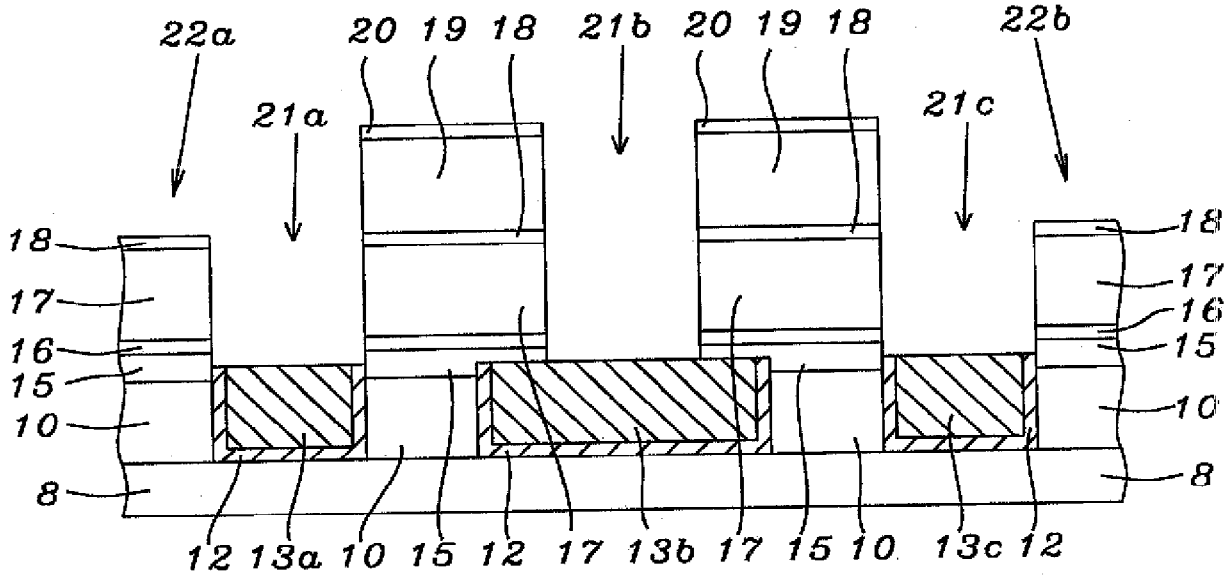

22a
20 19 18
21b
20 19 18
22b
21a
21c
18
17
16
15
10
8
12 13a 10 15 12 17 13b 17 15 10 13c 12

FIG. 4

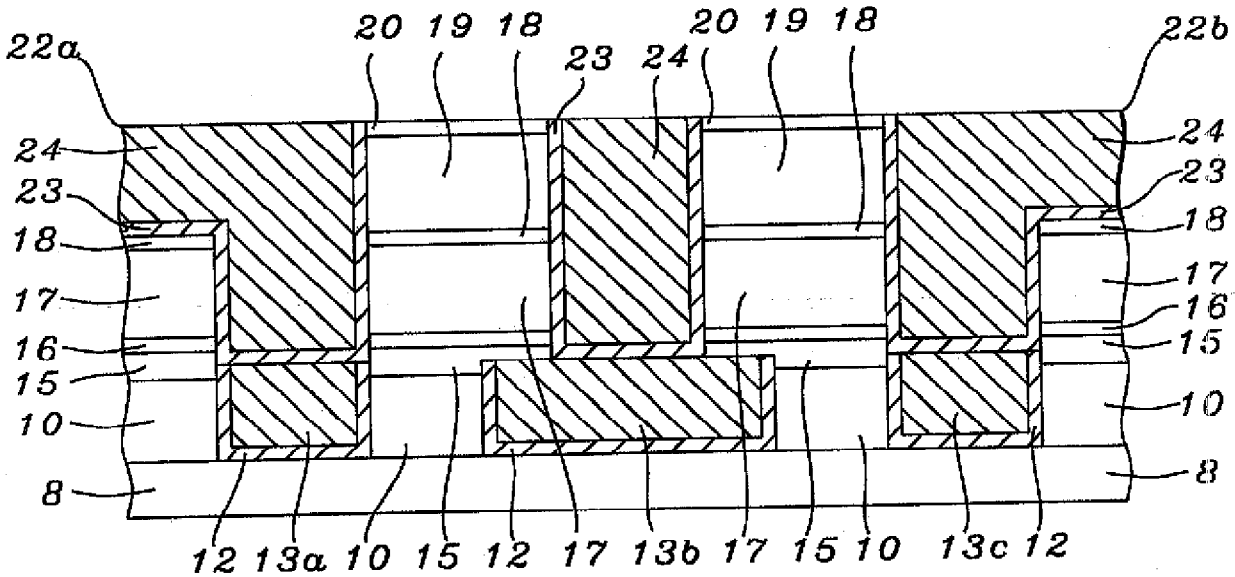

22a
20 19 18
23 24
20 19 18
22b
24
23
18
17
16
15
10
8
12 13a 10 15 12 17 13b 17 15 10 13c 12

FIG. 5

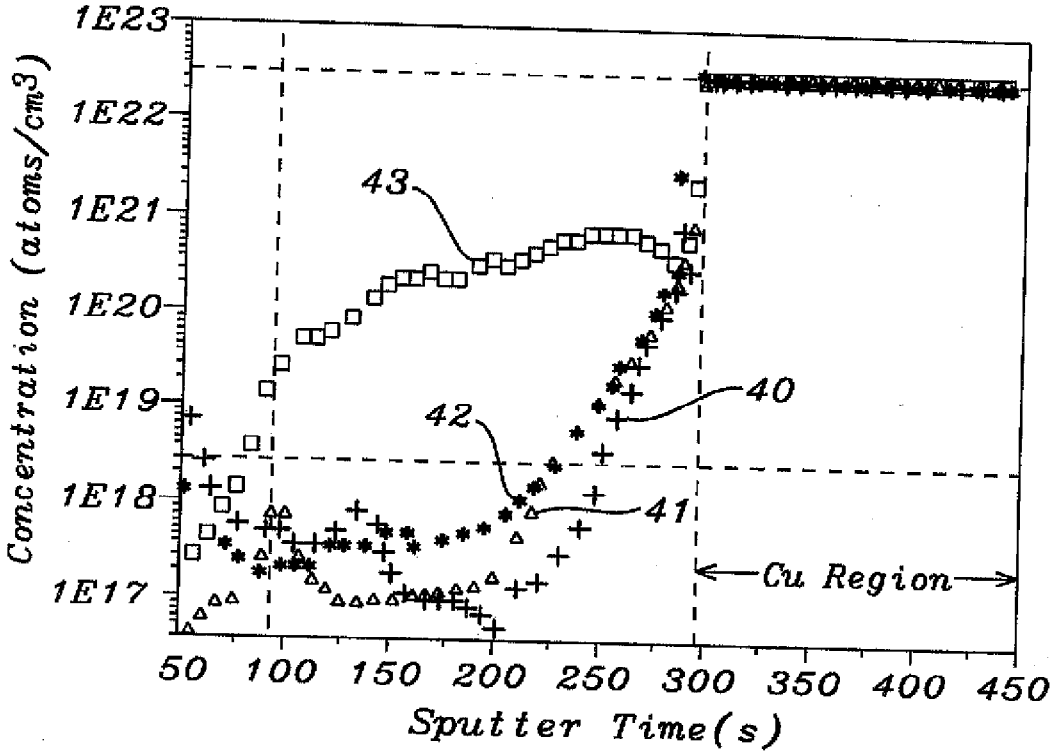

1E23
1E22
1E21
1E20
1E19
1E18
1E17
Concentration (atoms/cm3)
43
42
40
41
Cu Region
50 100 150 200 250 300 350 400 450
Sputter Time(s)
+ 0 sccmO2
△ 40 sccmO2
* 75 sccmO2
□ 200 sccmO2

FIG. 6

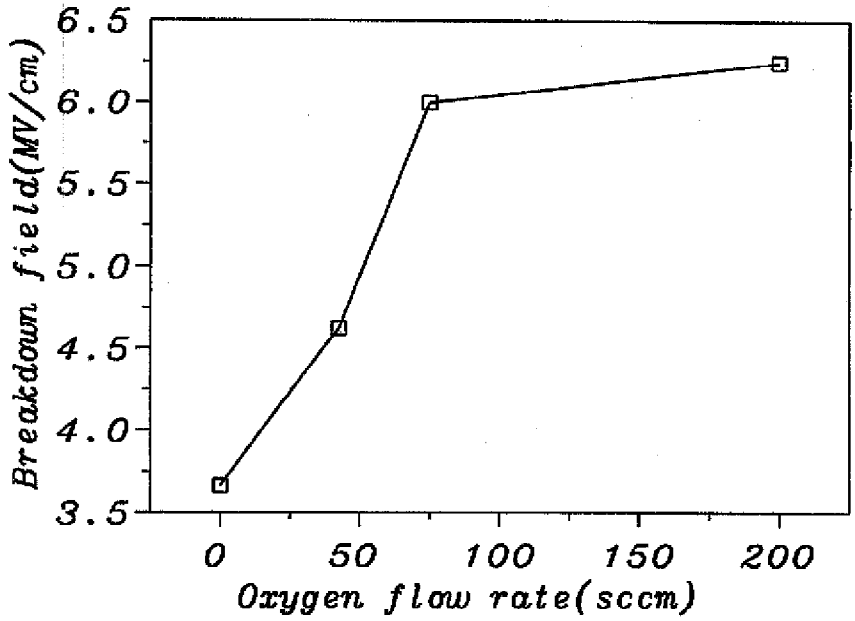

Breakdown field(MV/cm)
6.5
6.0
5.5
5.0
4.5
4.0
3.5
0
50
100
150
200
Oxygen flow rate(sccm)

FIG. 7

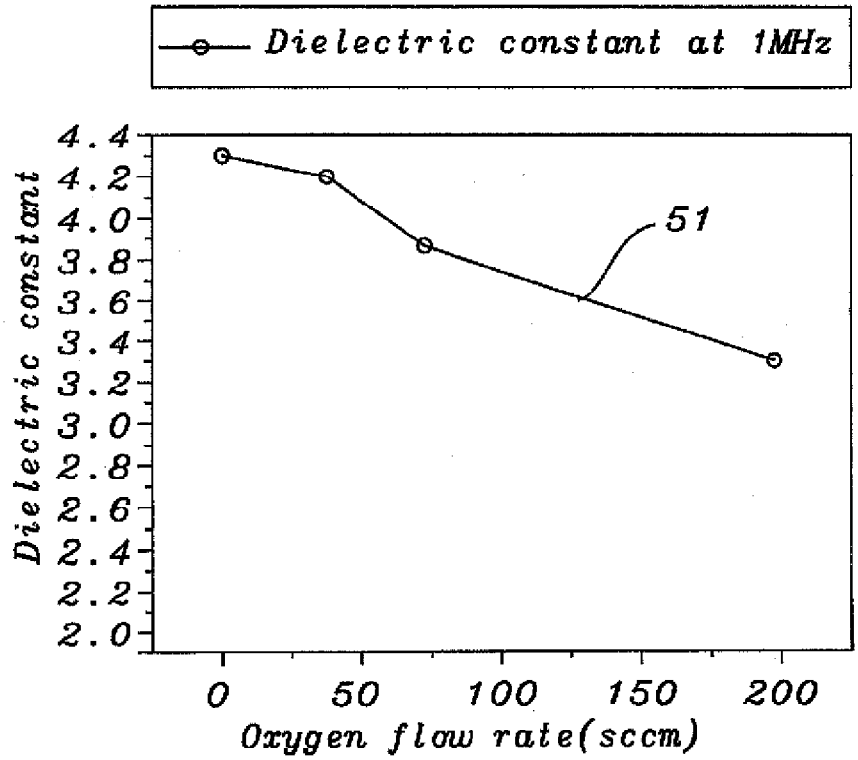

Dielectric constant at 1MHz
Dielectric constant
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
51
0
50
100
150
200
Oxygen flow rate(sccm)

FIG. 8