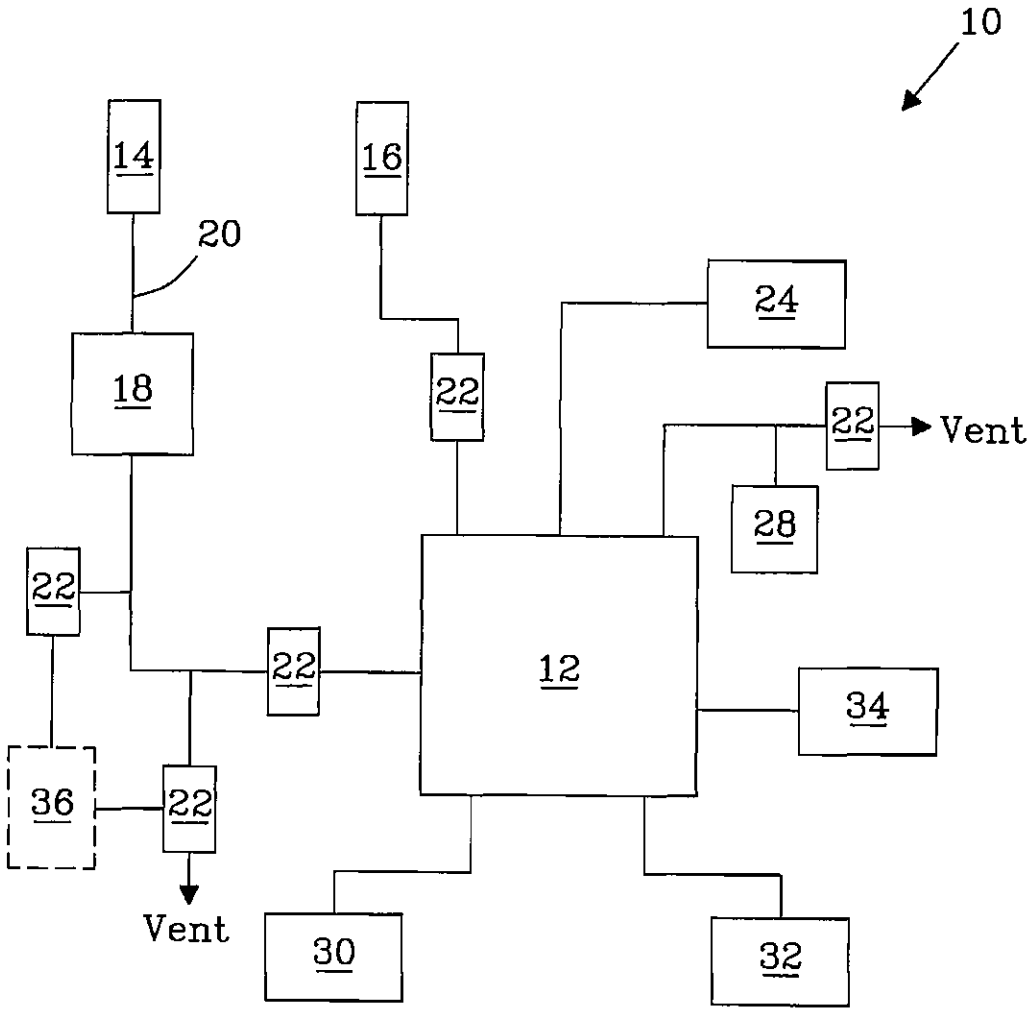


Fig. 1

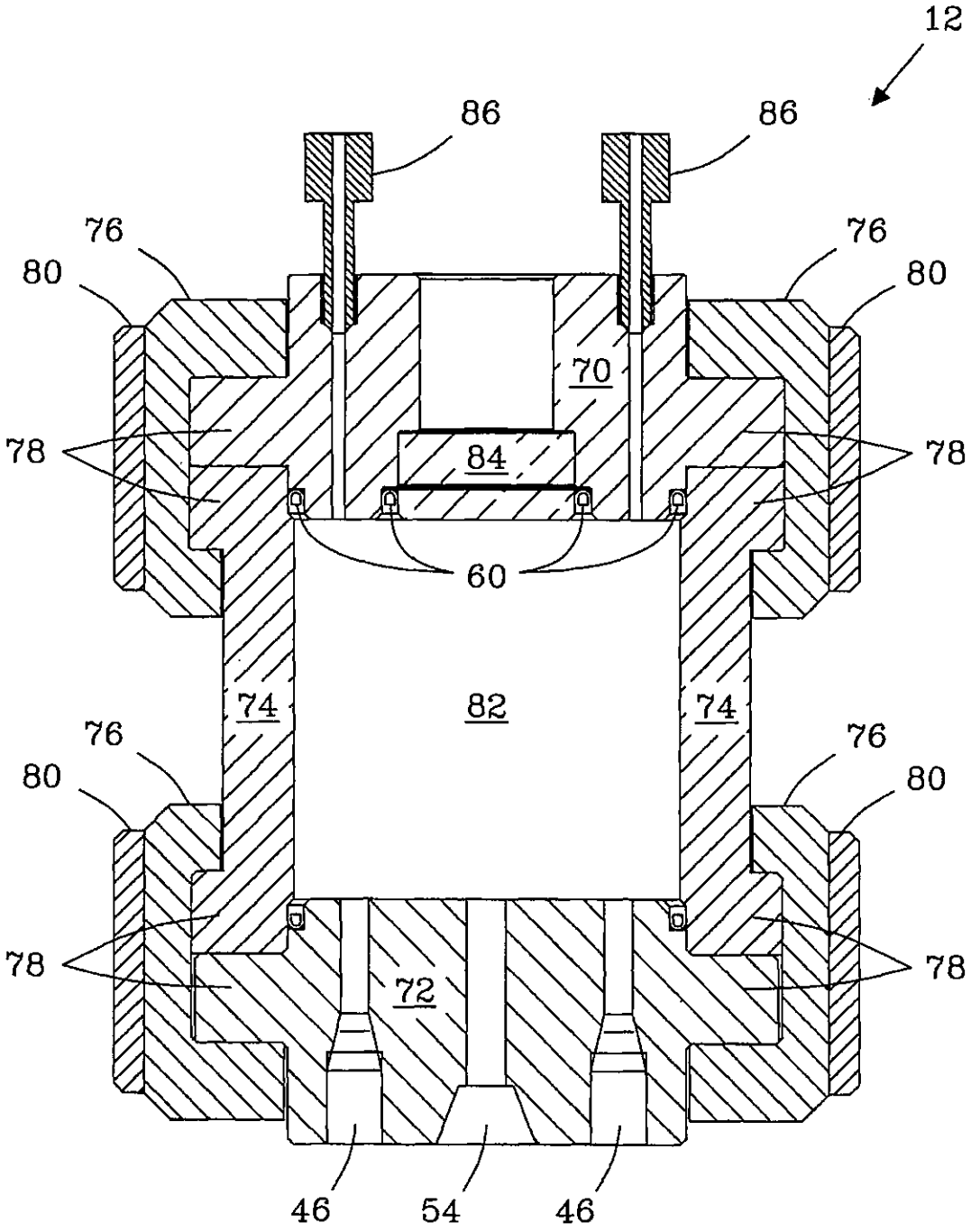

12
86
86
76
76
80
80
70
78
84
78
60
74
82
74
76
76
80
80
78
72
78
46
54
46

Fig. 2

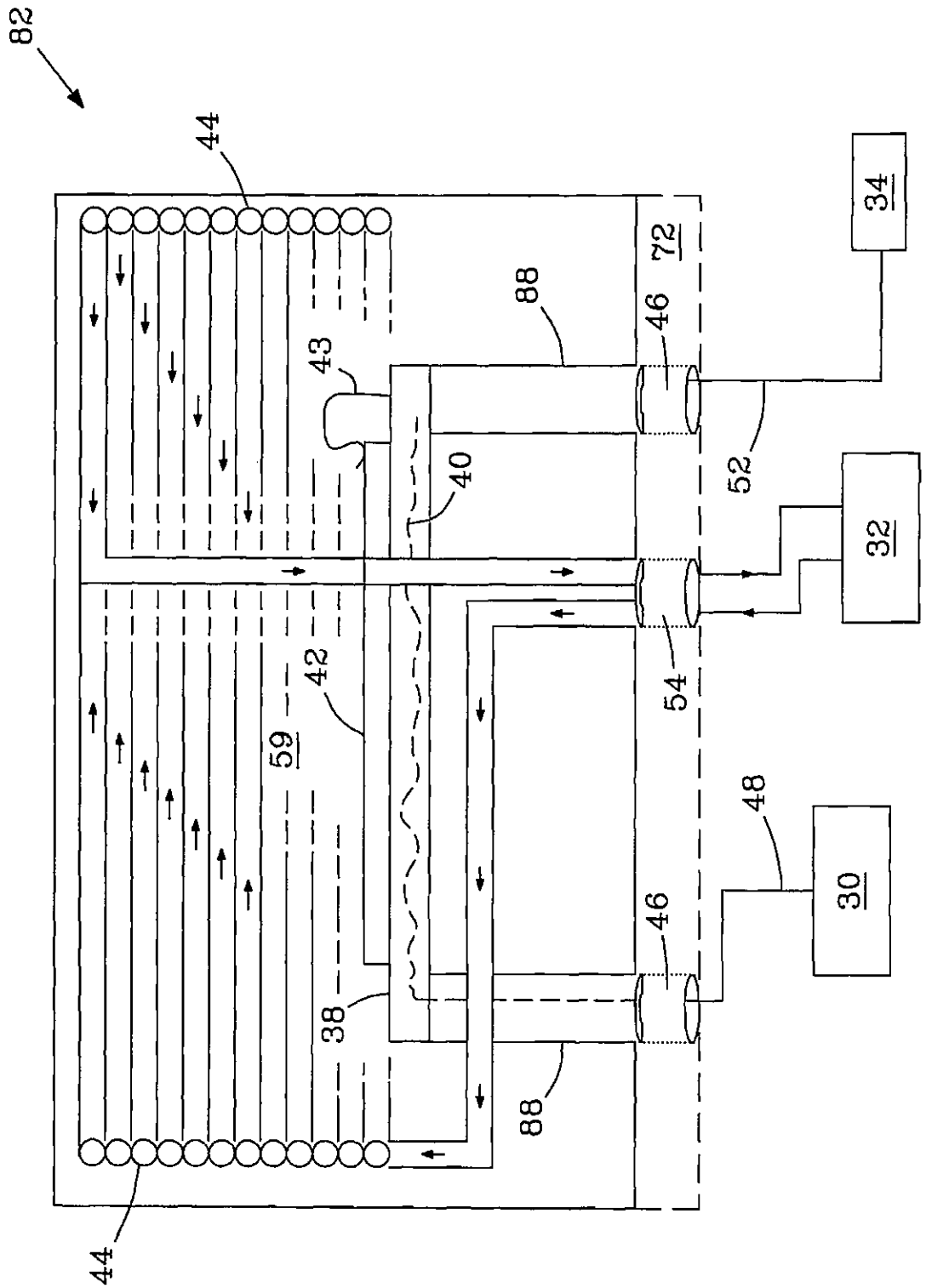


Fig. 3

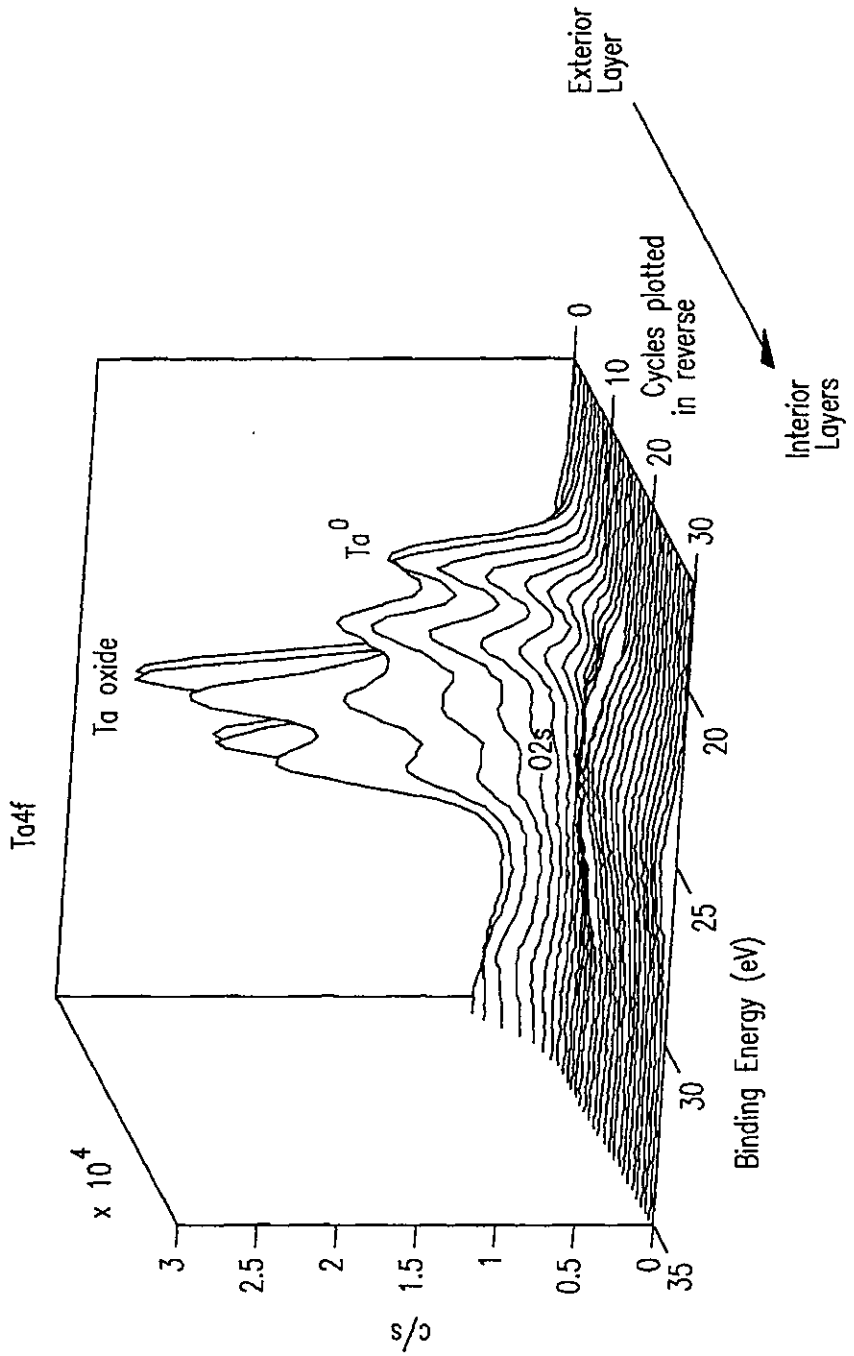

Exterior Layer
Interior Layers
Cycles plotted in reverse
0
10
20
30
Ta4f
Ta oxide
Ta0
025
x 10^4
3
2.5
2
1.5
1
0.5
0
c/s
35
30
25
20
Binding Energy (eV)

Fig. 4

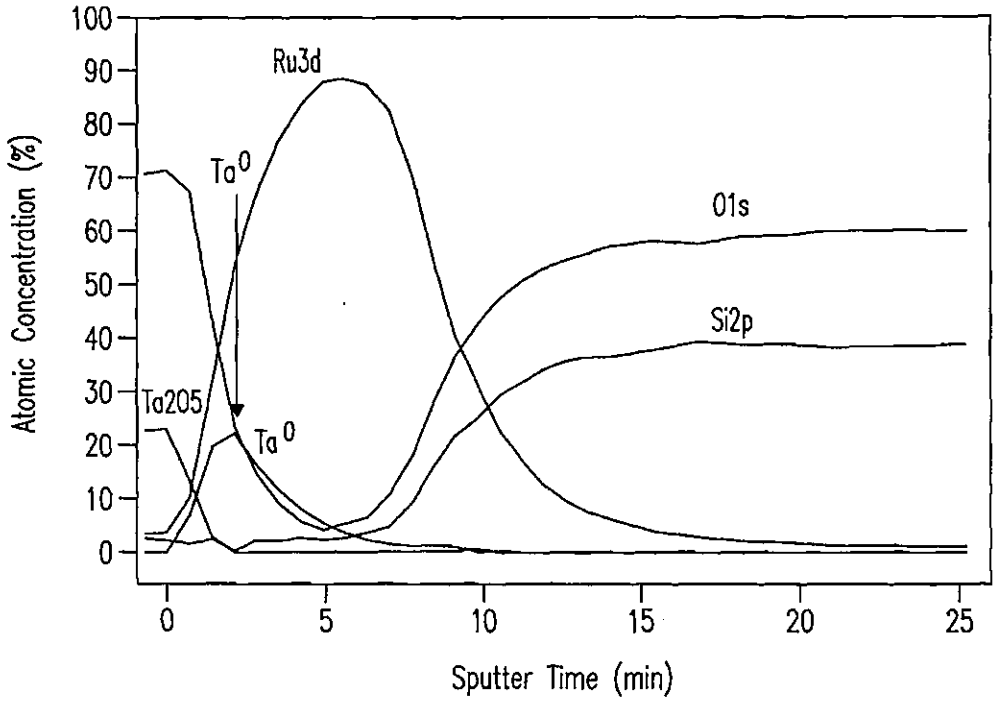

Atomic Concentration (%)
100
90
80
70
60
50
40
30
20
10
0
Ru3d
Ta0
01s
Si2p
Ta205
Ta0
0
5
10
15
20
25
Sputter Time (min)

Fig. 5

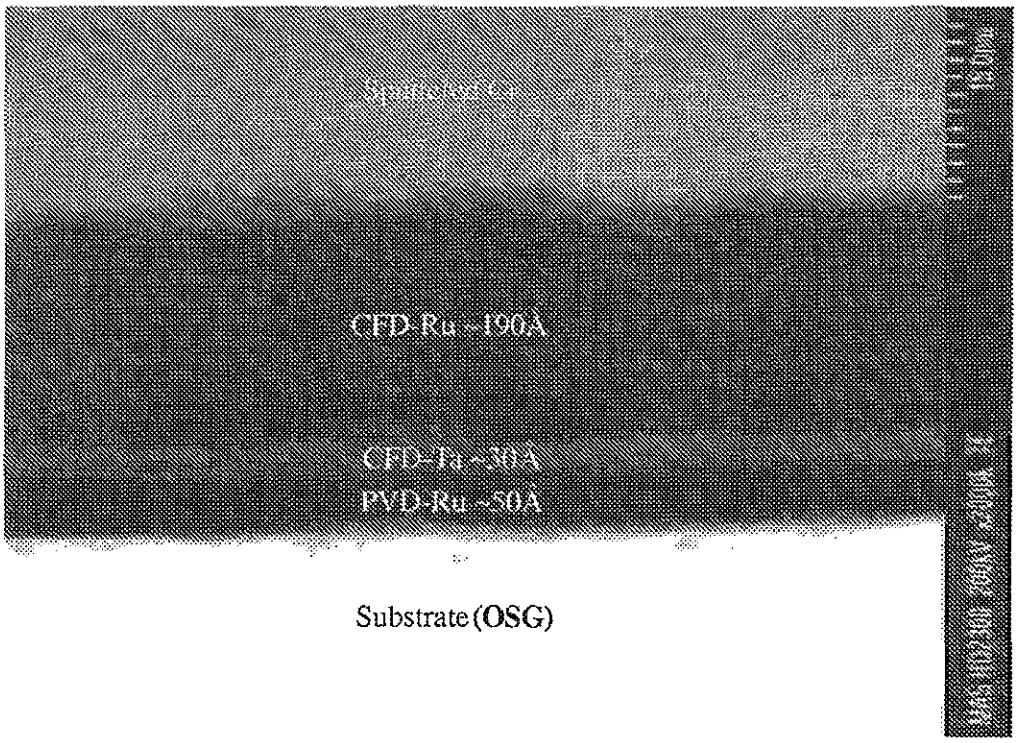


Fig.6

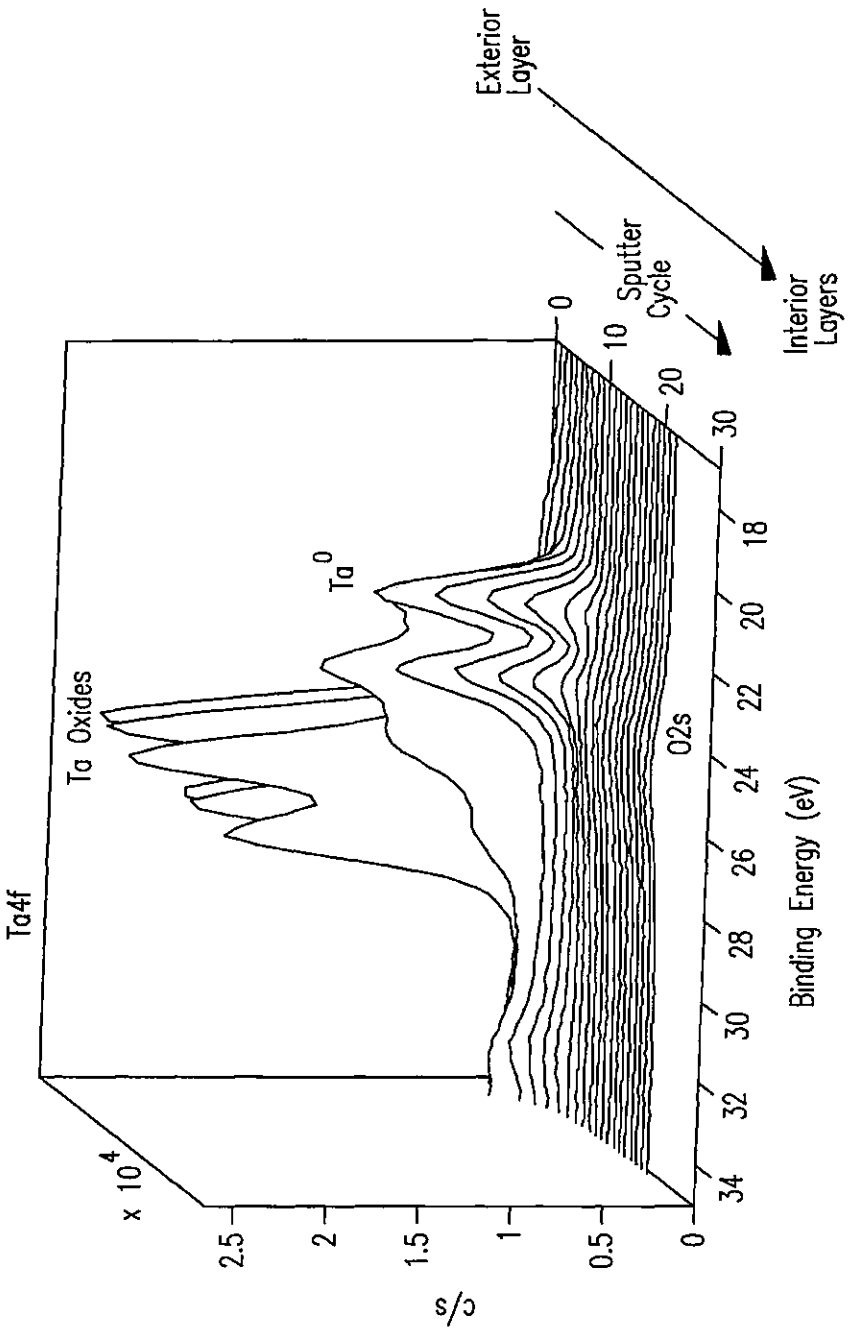

Exterior Layer
Sputter Cycle
Interior Layers
0
10
20
30
Ta4f
Ta Oxides
Ta0
02s
x 10^4
2.5
2
1.5
1
0.5
0
c/s
34
32
30
28
26
24
22
20
18
Binding Energy (eV)

Fig. 7

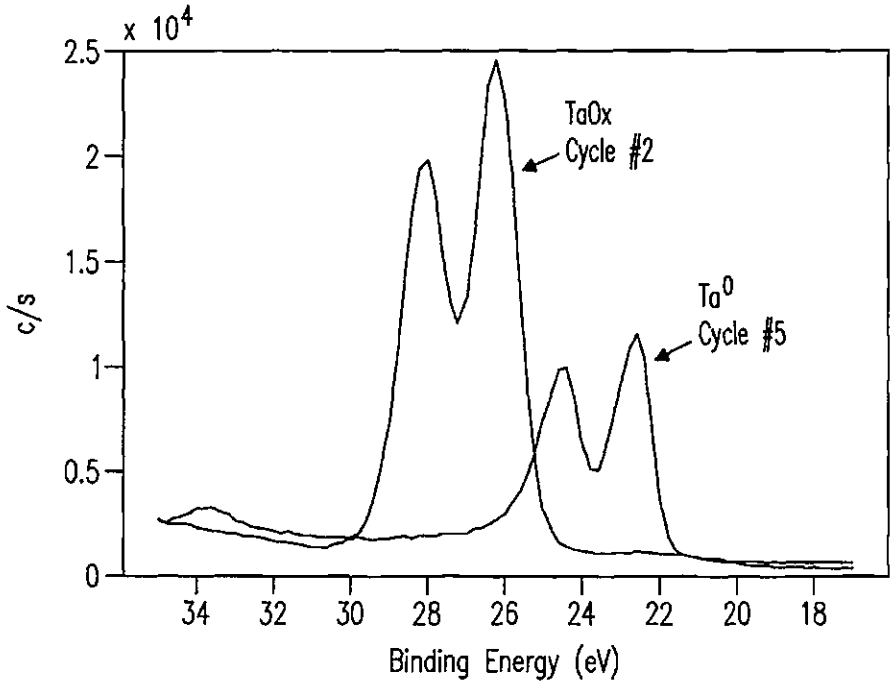

x 10^4
2.5
2
1.5
1
0.5
0
c/s
TaOx
Cycle #2
Ta^0
Cycle #5
34
32
30
28
26
24
22
20
18
Binding Energy (eV)

Fig. 8

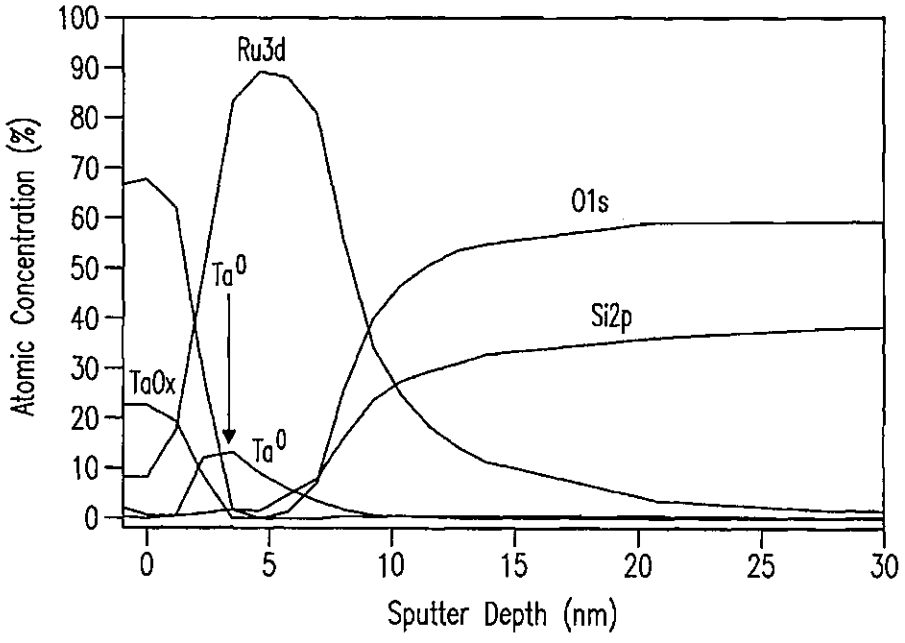

100
90
80
70
60
50
40
30
20
10
0
Atomic Concentration (%)
Ru3d
Ta^0
TaOx
Ta^0
01s
Si2p
0
5
10
15
20
25
30
Sputter Depth (nm)

Fig. 9

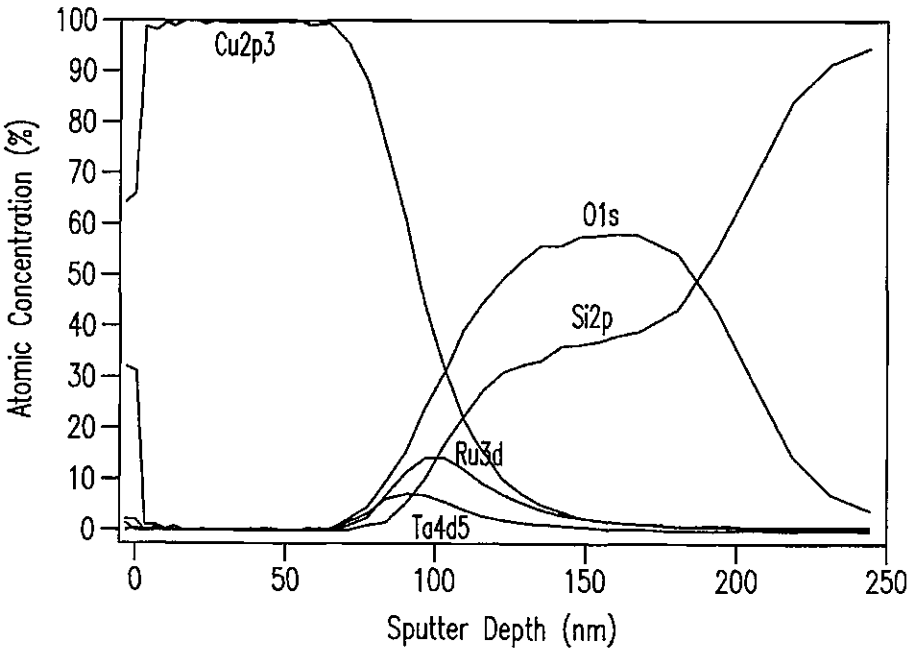

Atomic Concentration (%)
100
90
80
70
60
50
40
30
20
10
0
Cu2p3
O1s
Si2p
Ru3d
Ta4d5
0
50
100
150
200
250
Sputter Depth (nm)

Fig. 10

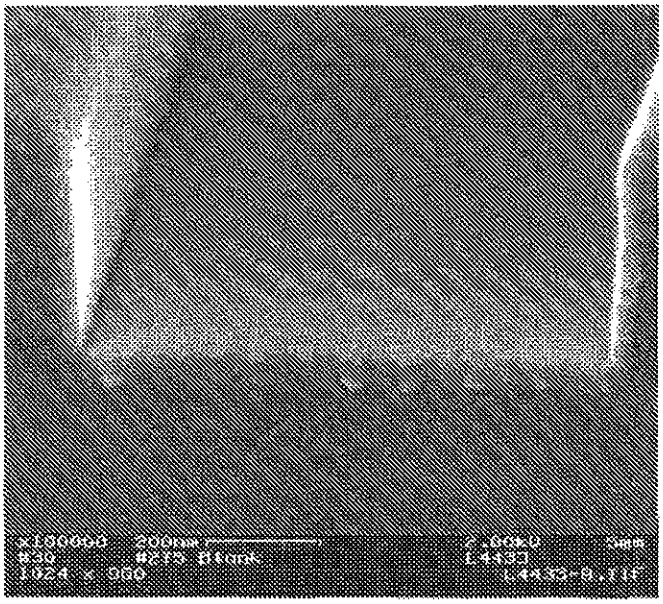


Fig. 11a

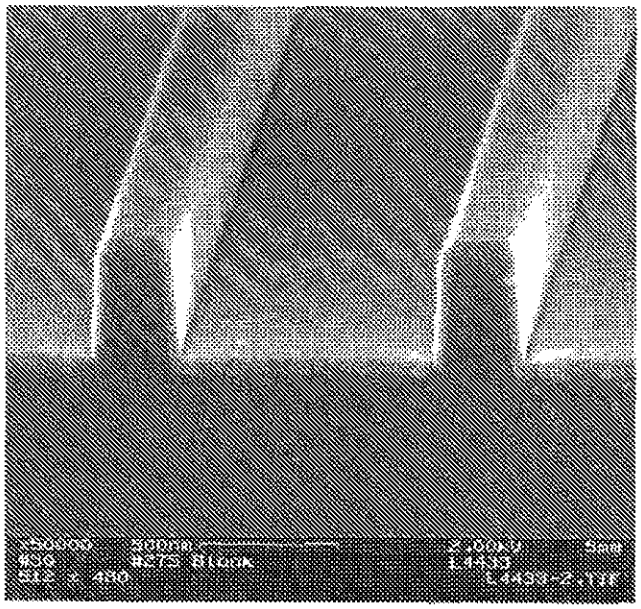


Fig. 11b

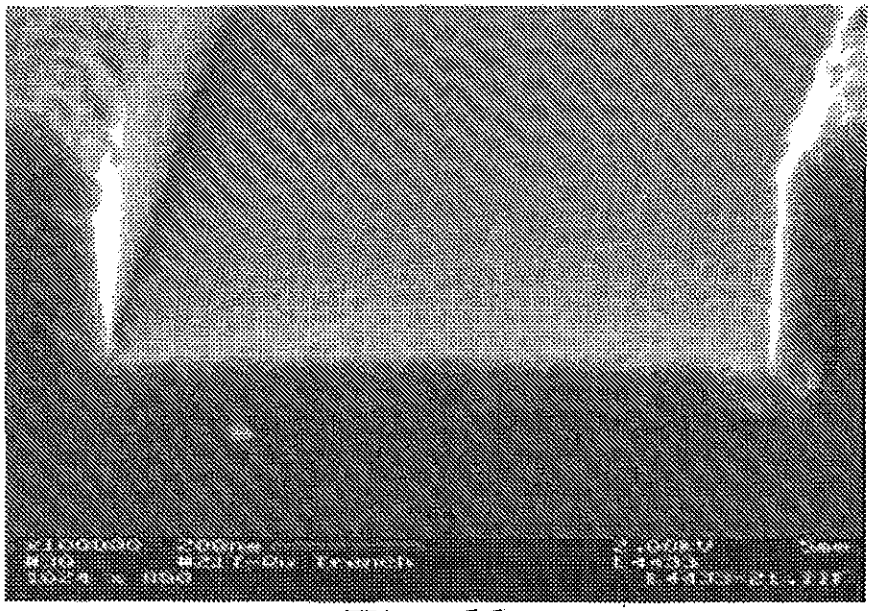


Fig. 11c

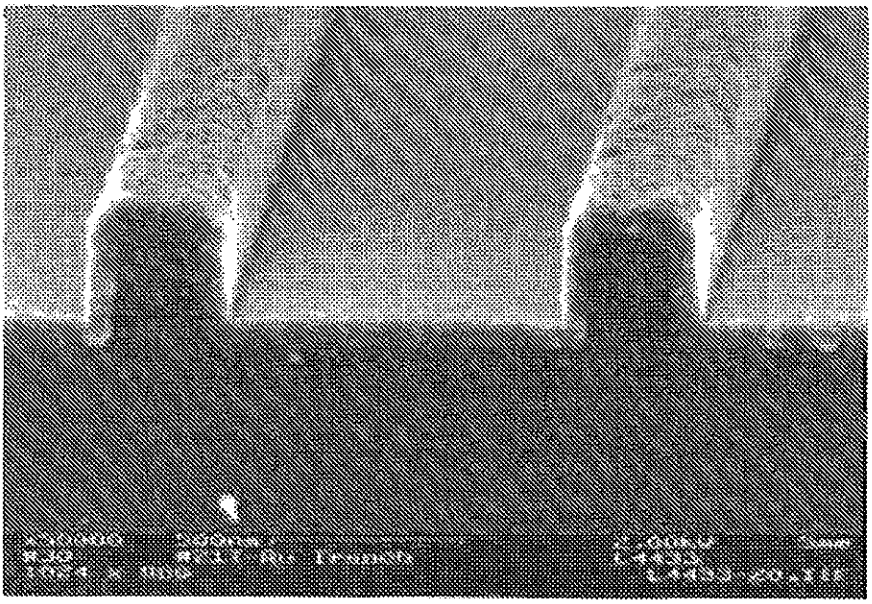


Fig. 11d

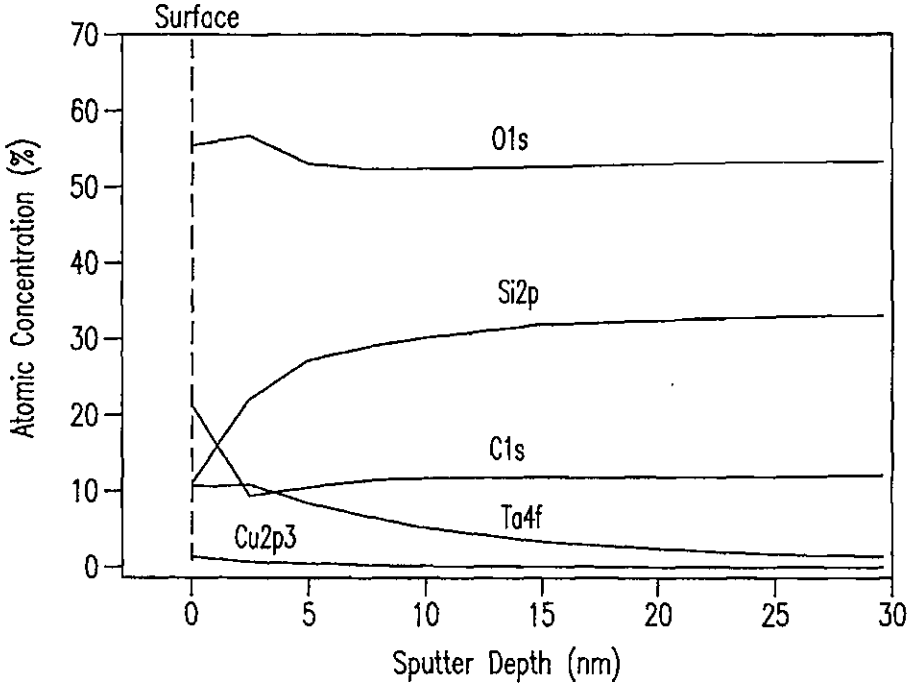

Surface
70
60
50
40
30
20
10
0
Atomic Concentration (%)
O1s
Si2p
C1s
Ta4f
Cu2p3
0
5
10
15
20
25
30
Sputter Depth (nm)

Fig. 12