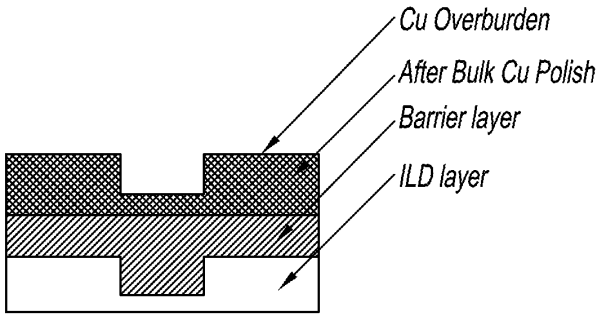
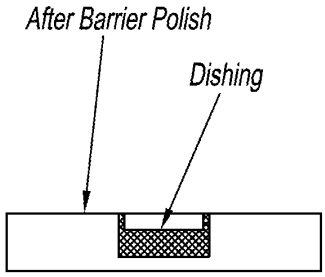




Typical process concept of copper CMP (Prior Art)

Fig. 1a
(Prior Art)

Fig. 1b
(Prior Art)

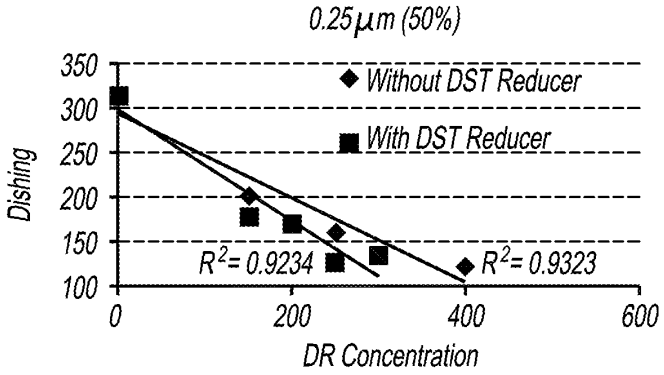


Fig. 2a

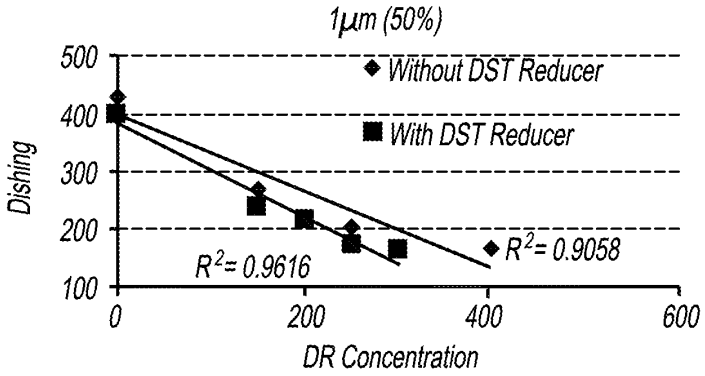


Fig. 2b

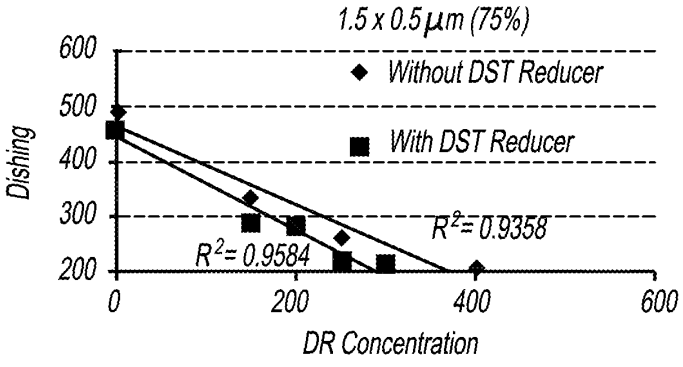


Fig. 2c

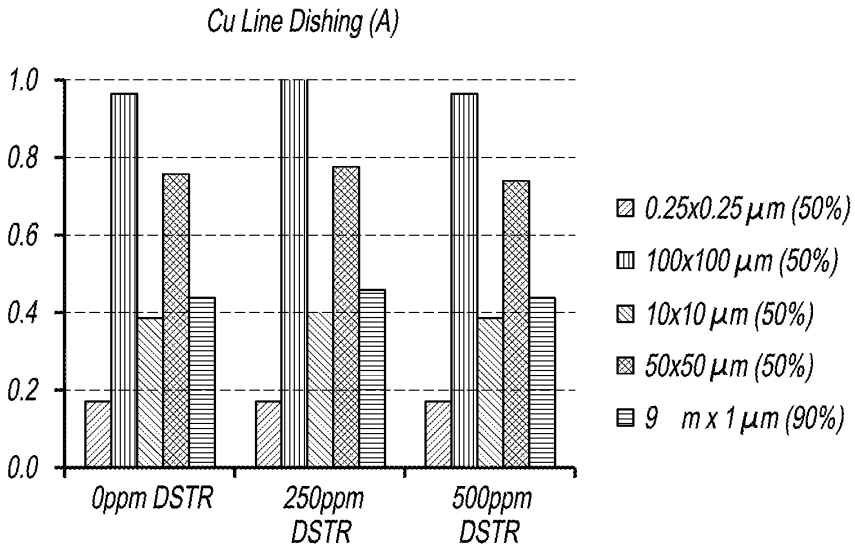
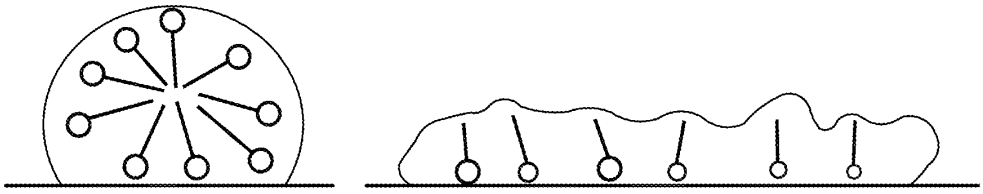

Cu Line Dishing (A)
1.0
0.8
0.6
0.4
0.2
0.0
0ppm DSTR
250ppm DSTR
500ppm DSTR
0.25x0.25 μm (50%)
100x100 μm (50%)
10x10 μm (50%)
50x50 μm (50%)
9 m x 1 μm (90%)

Fig. 2d



Hydrophobic drop, no DST Reducer *Hydrophobic drop, contains DST Reducer*

Fig. 3a

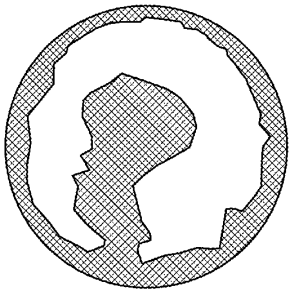


Fig. 3b

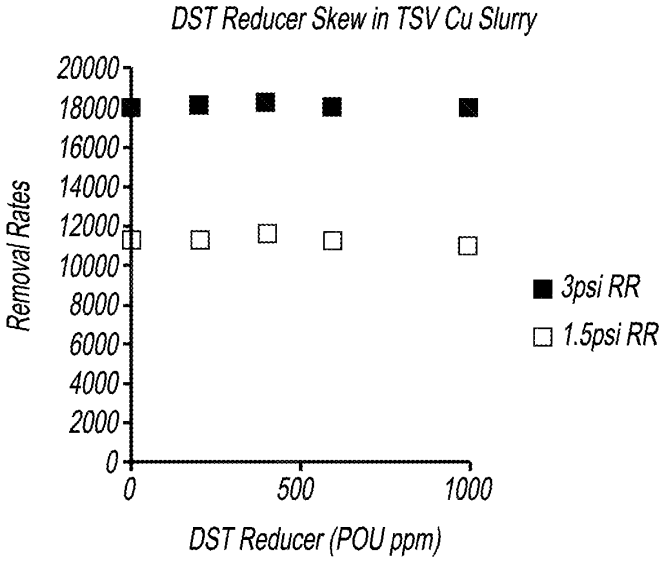

DST Reducer Skew in TSV Cu Slurry
Removal Rates
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
500
1000
DST Reducer (POU ppm)
3psi RR
1.5psi RR

Fig. 4a

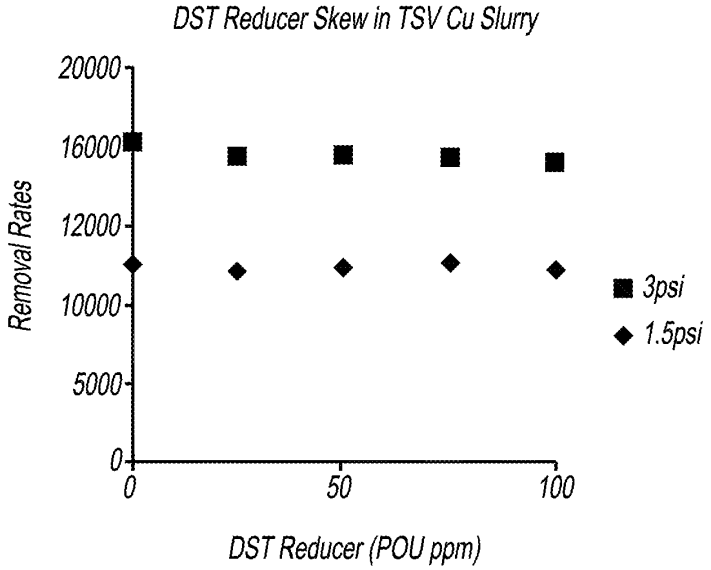

DST Reducer Skew in TSV Cu Slurry
Removal Rates
20000
16000
12000
10000
5000
0
0
50
100
DST Reducer (POU ppm)
3psi
1.5psi

Fig. 4b

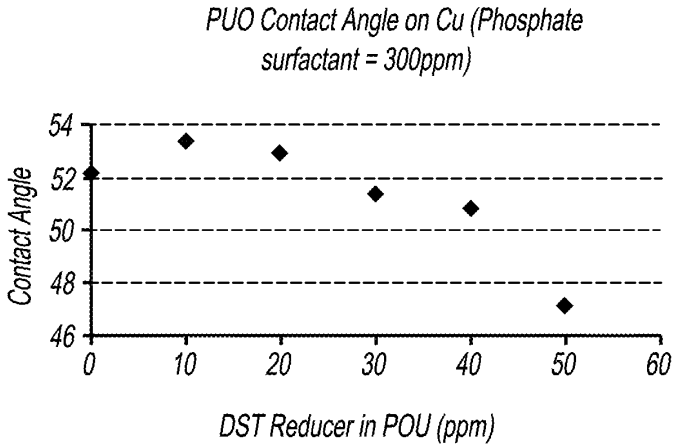

PUO Contact Angle on Cu (Phosphate surfactant = 300ppm)
Contact Angle
54
52
50
48
46
0
10
20
30
40
50
60
DST Reducer in POU (ppm)

Fig. 5a

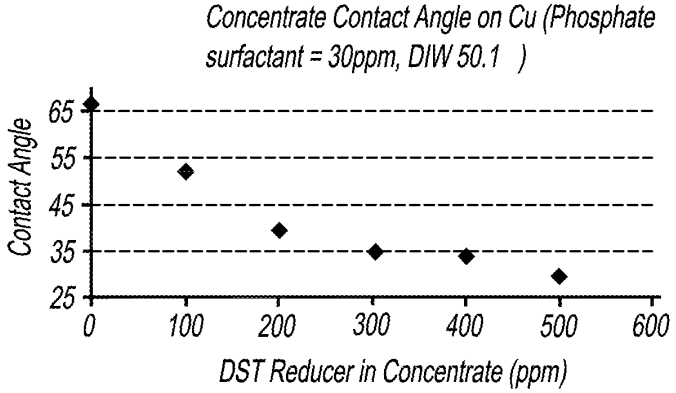

Concentrate Contact Angle on Cu (Phosphate surfactant = 30ppm, DIW 50.1)
Contact Angle
65
55
45
35
25
0
100
200
300
400
500
600
DST Reducer in Concentrate (ppm)

Fig. 5b

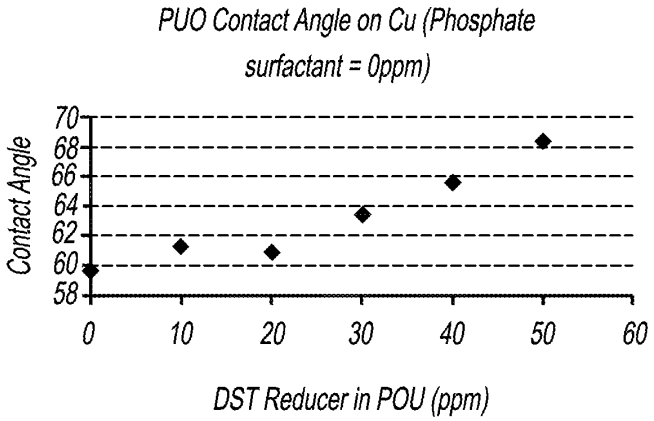

PUO Contact Angle on Cu (Phosphate surfactant = 0ppm)
Contact Angle
70
68
66
64
62
60
58
0
10
20
30
40
50
60
DST Reducer in POU (ppm)

Fig. 5c

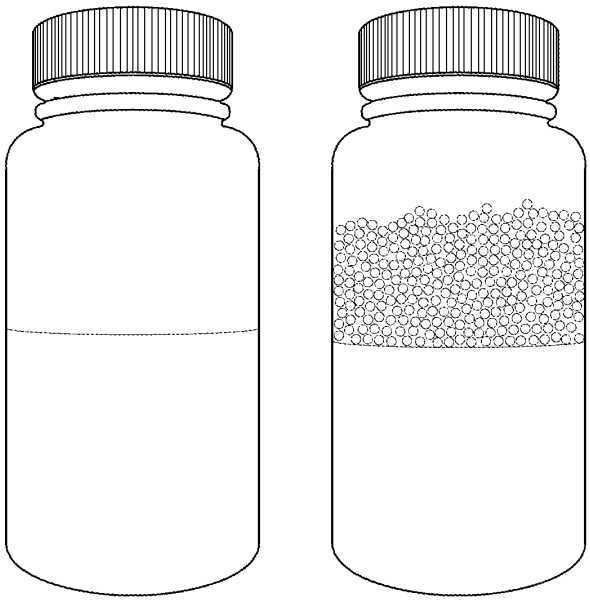


Fig. 6