FIG. 1

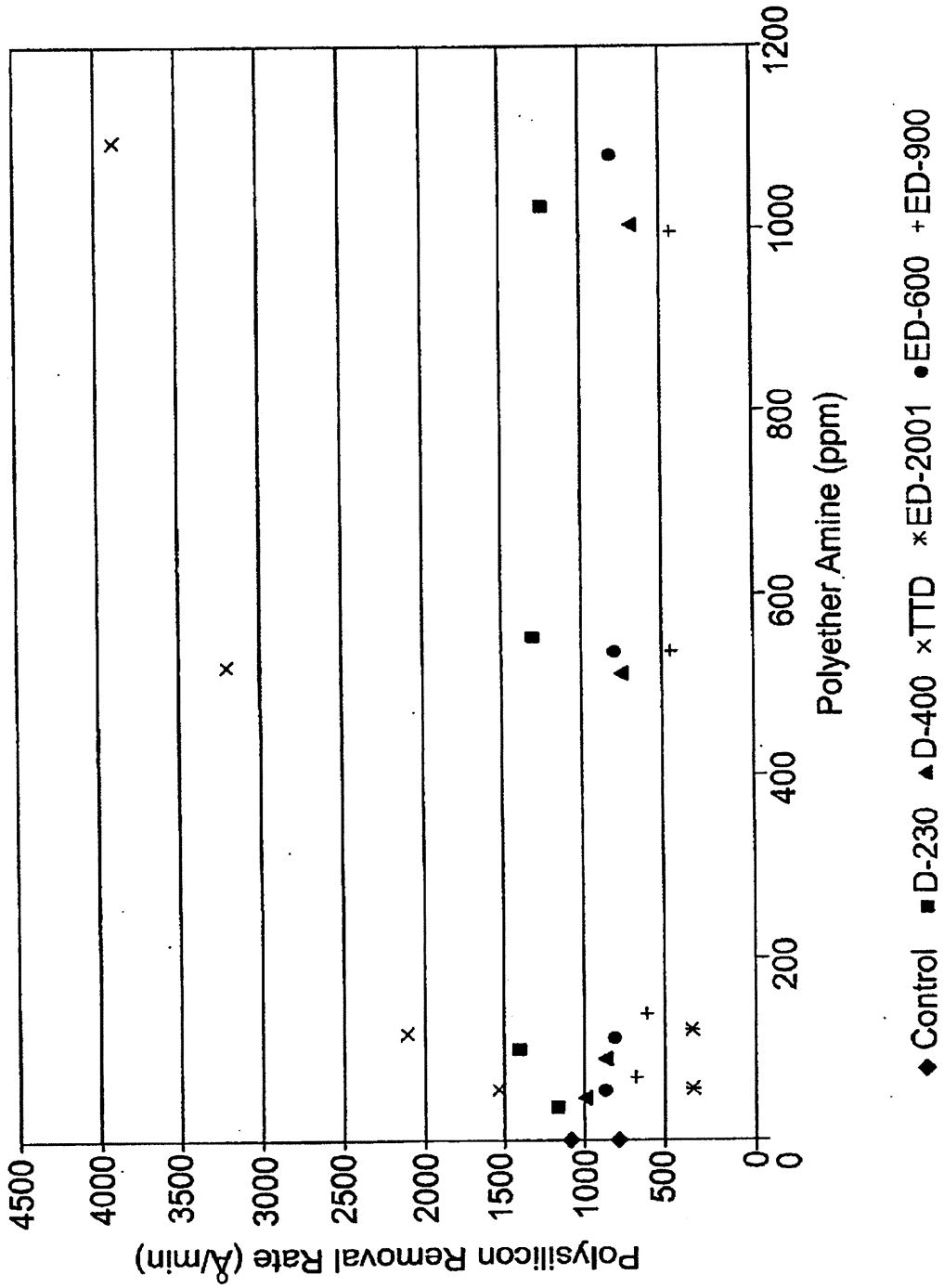

Polysilicon Removal Rate (Å/min)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
200
400
600
800
1000
1200
Polyether Amine (ppm)
◆Control ■D-230 ▲D-400 ×TTD ×ED-2001 ●ED-600 +ED-900

FIG. 2

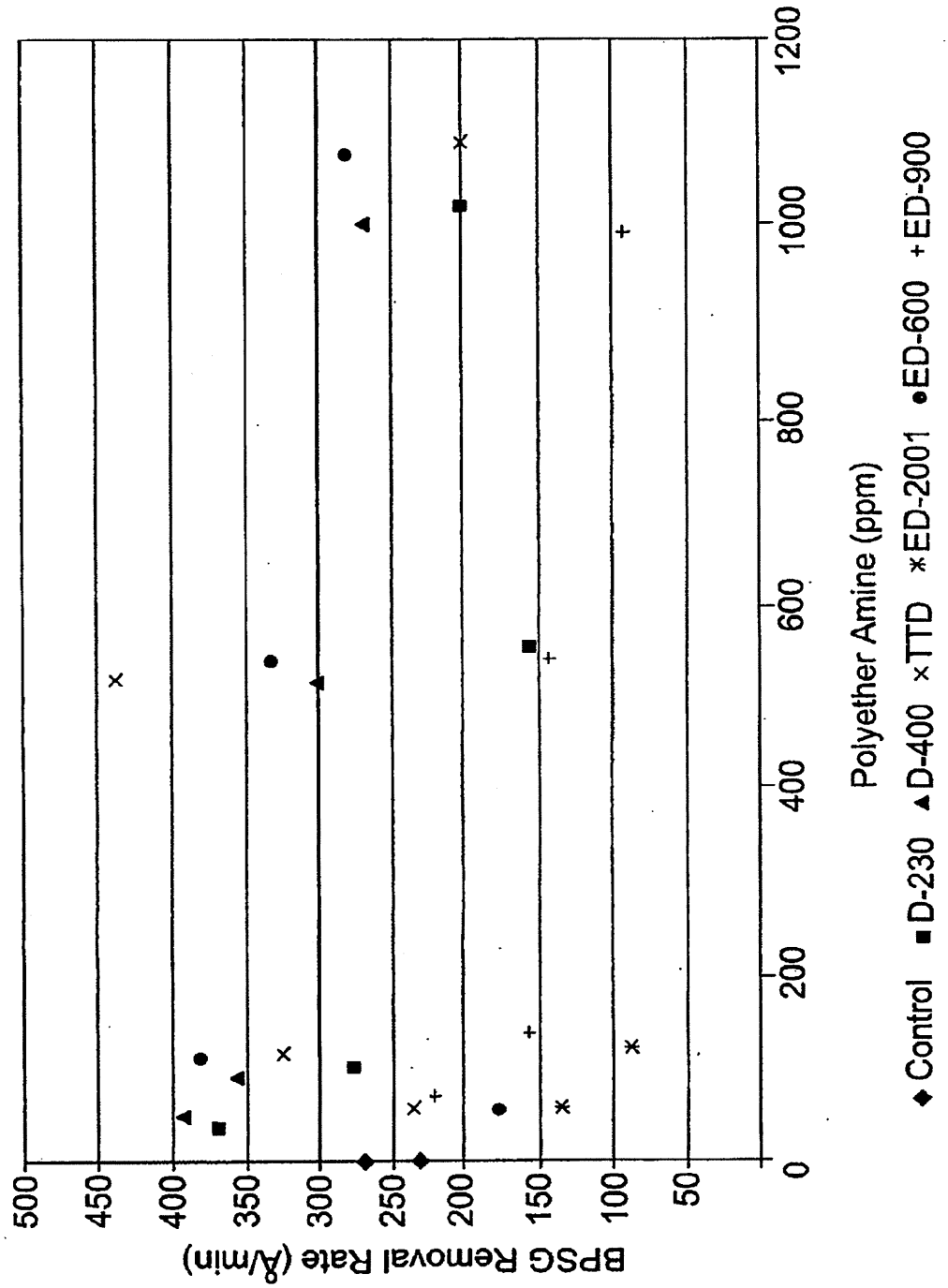

BPSG Removal Rate (Å/min)
500
450
400
350
300
250
200
150
100
50
0
200
400
600
800
1000
1200
Polyether Amine (ppm)
◆Control ■D-230 ▲D-400 ×TTD *ED-2001 •ED-600 +ED-900

FIG. 3

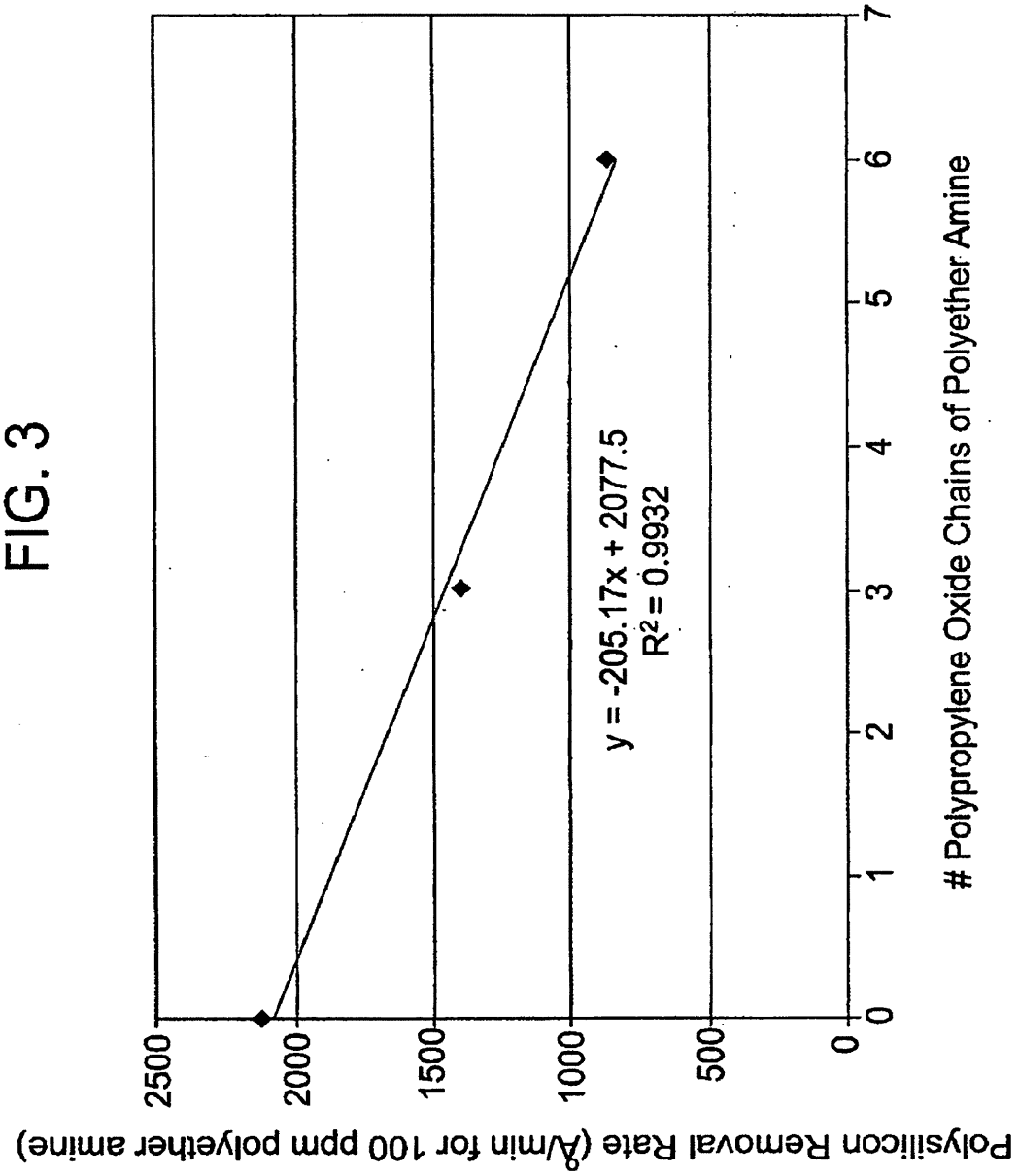

Polysilicon Removal Rate (Å/min for 100 ppm polyether amine)
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
# Polypropylene Oxide Chains of Polyether Amine
y = -205.17x + 2077.5
R² = 0.9932

FIG. 4

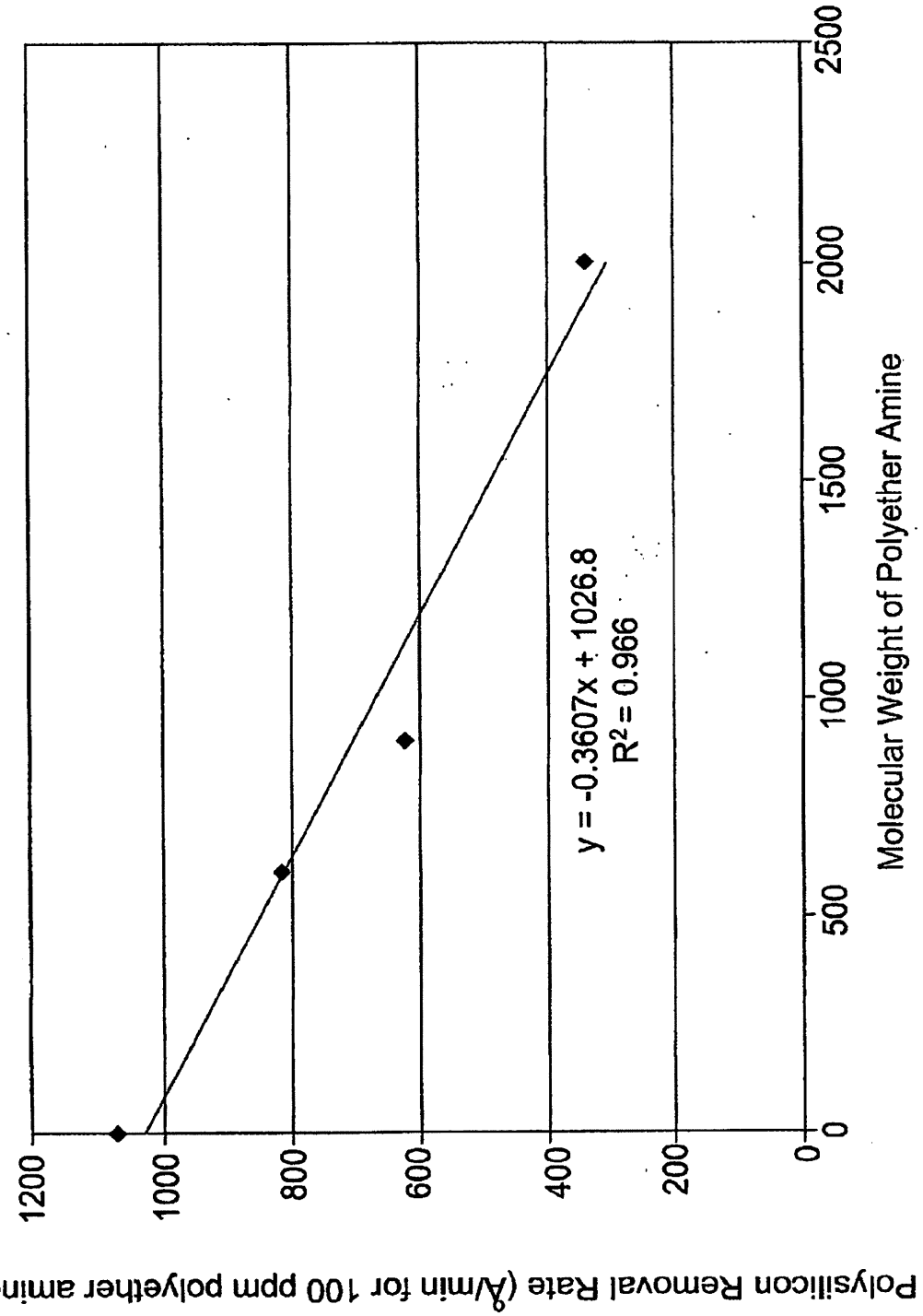

Polysilicon Removal Rate (Å/min for 100 ppm polyether amine)
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
Molecular Weight of Polyether Amine
y = -0.3607x + 1026.8
R2 = 0.966

FIG. 5

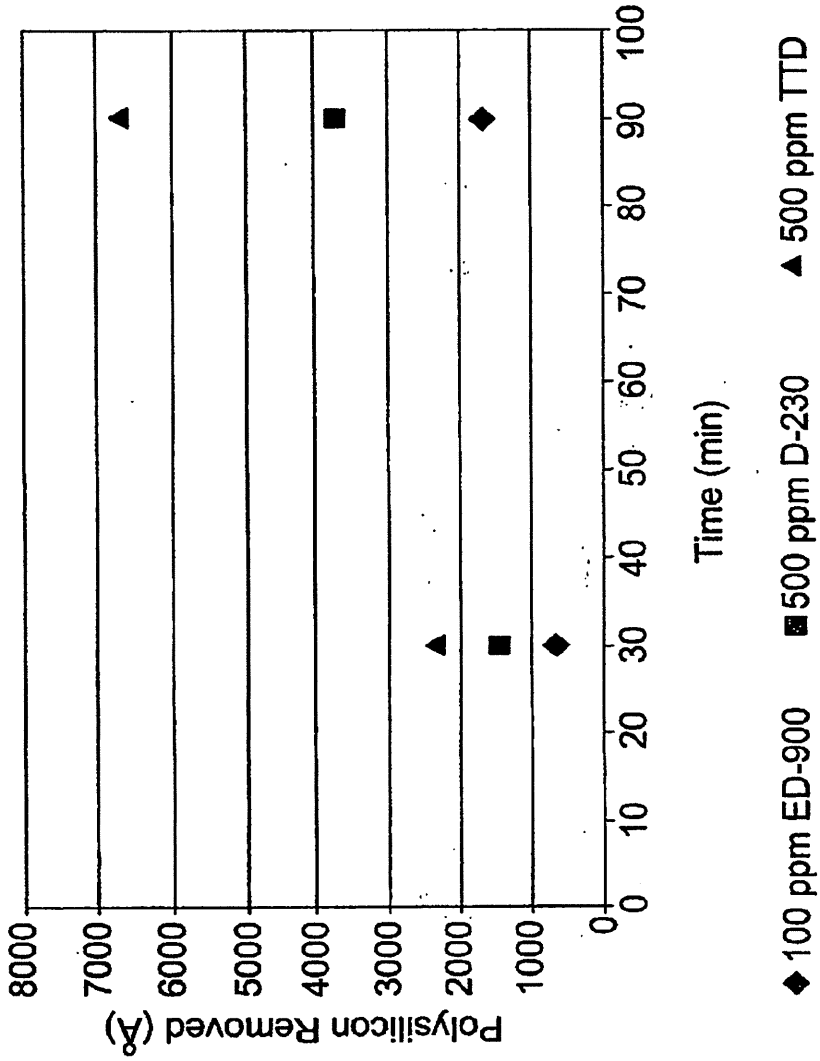

Polysilicon Removed (Å)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
60
70
80
90
100
Time (min)
100 ppm ED-900
500 ppm D-230
500 ppm TTD

FIG. 6

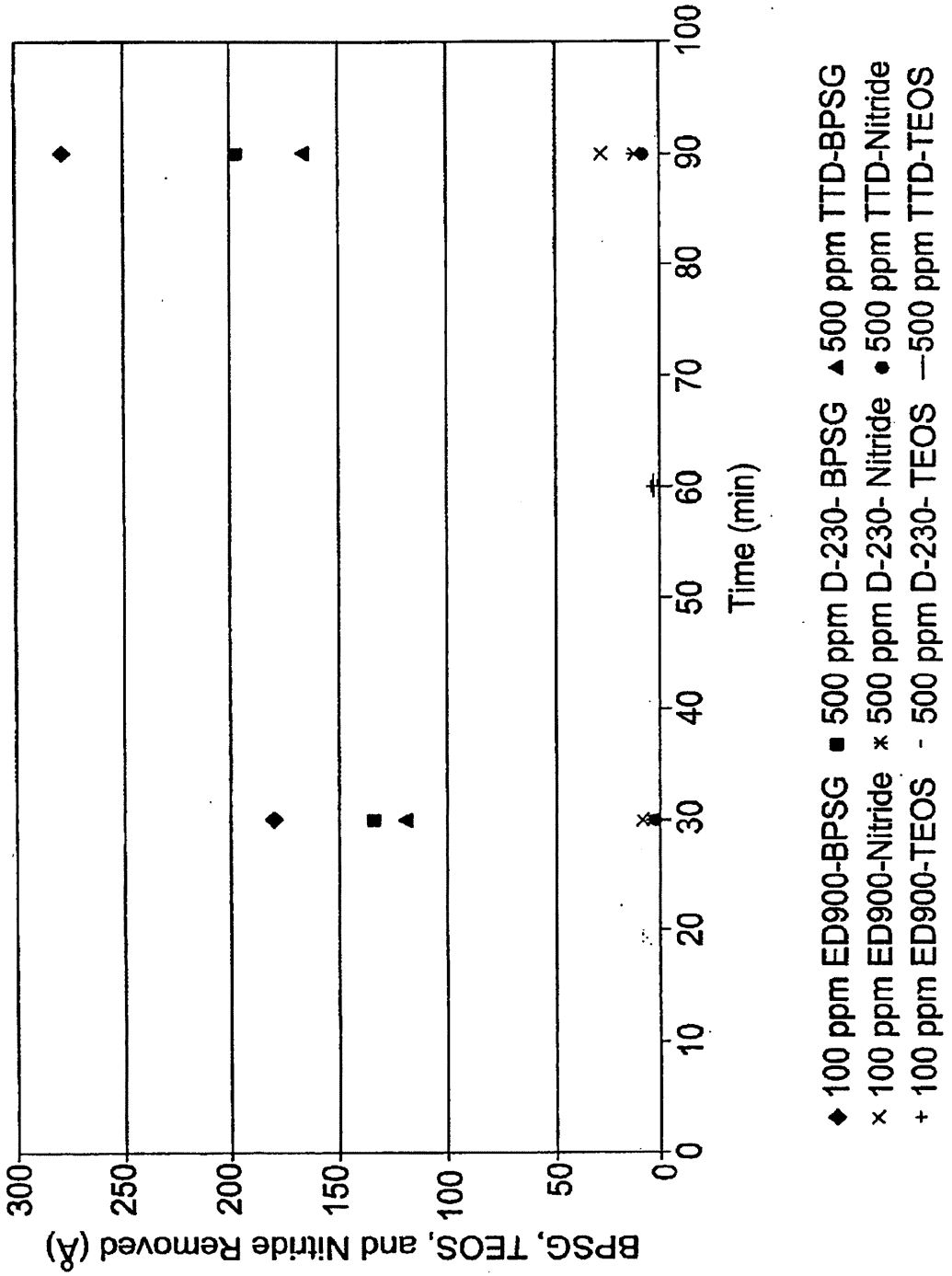

BPSG, TEOS, and Nitride Removed (Å)
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
100
Time (min)
◆ 100 ppm ED900-BPSG ■ 500 ppm D-230- BPSG ▲ 500 ppm TTD-BPSG
× 100 ppm ED900-Nitride ∗ 500 ppm D-230- Nitride ● 500 ppm TTD-Nitride
+ 100 ppm ED900-TEOS - 500 ppm D-230- TEOS —500 ppm TTD-TEOS

FIG. 7

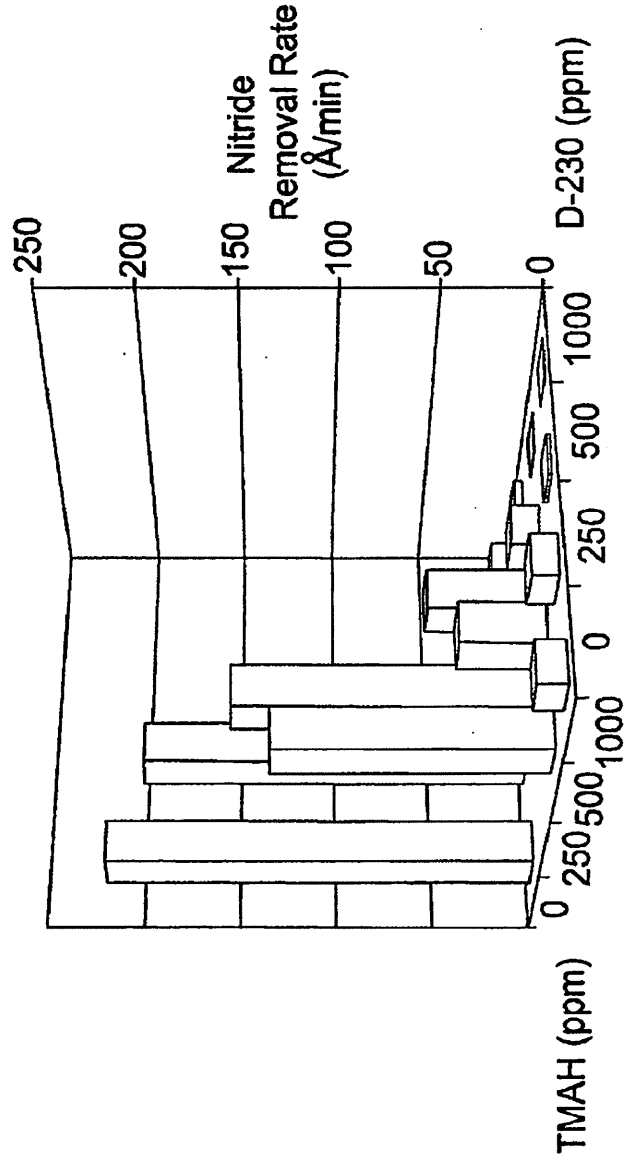

Nitride
Removal Rate
(Å/min)
250
200
150
100
50
0
D-230 (ppm)
1000
500
250
0
1000
500
250
0
TMAH (ppm)

FIG. 8

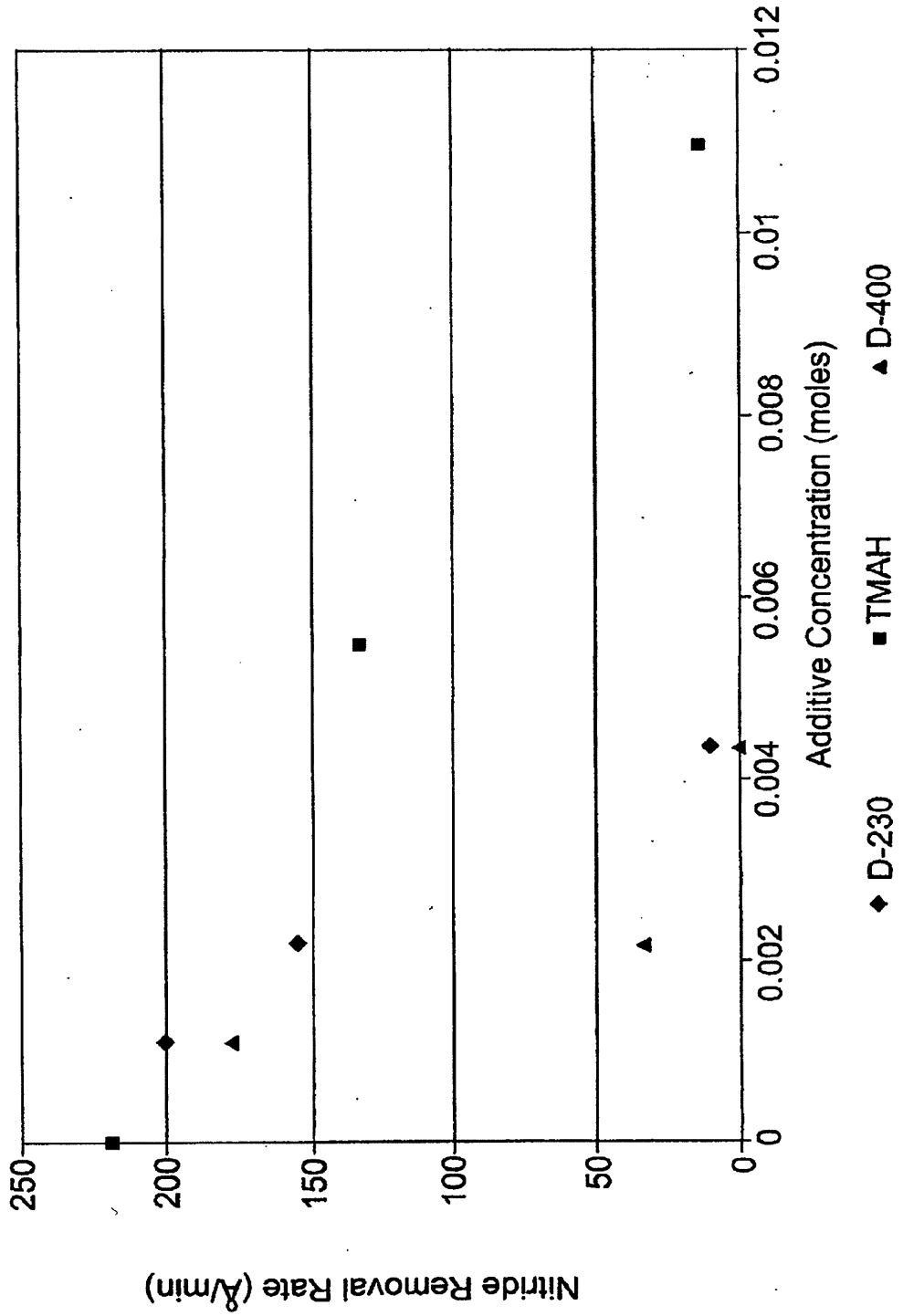

Nitride Removal Rate (Å/min)
250
200
150
100
50
0
0
0.002
0.004
0.006
0.008
0.01
0.012
Additive Concentration (moles)
D-230
TMAH
D-400

FIG. 9

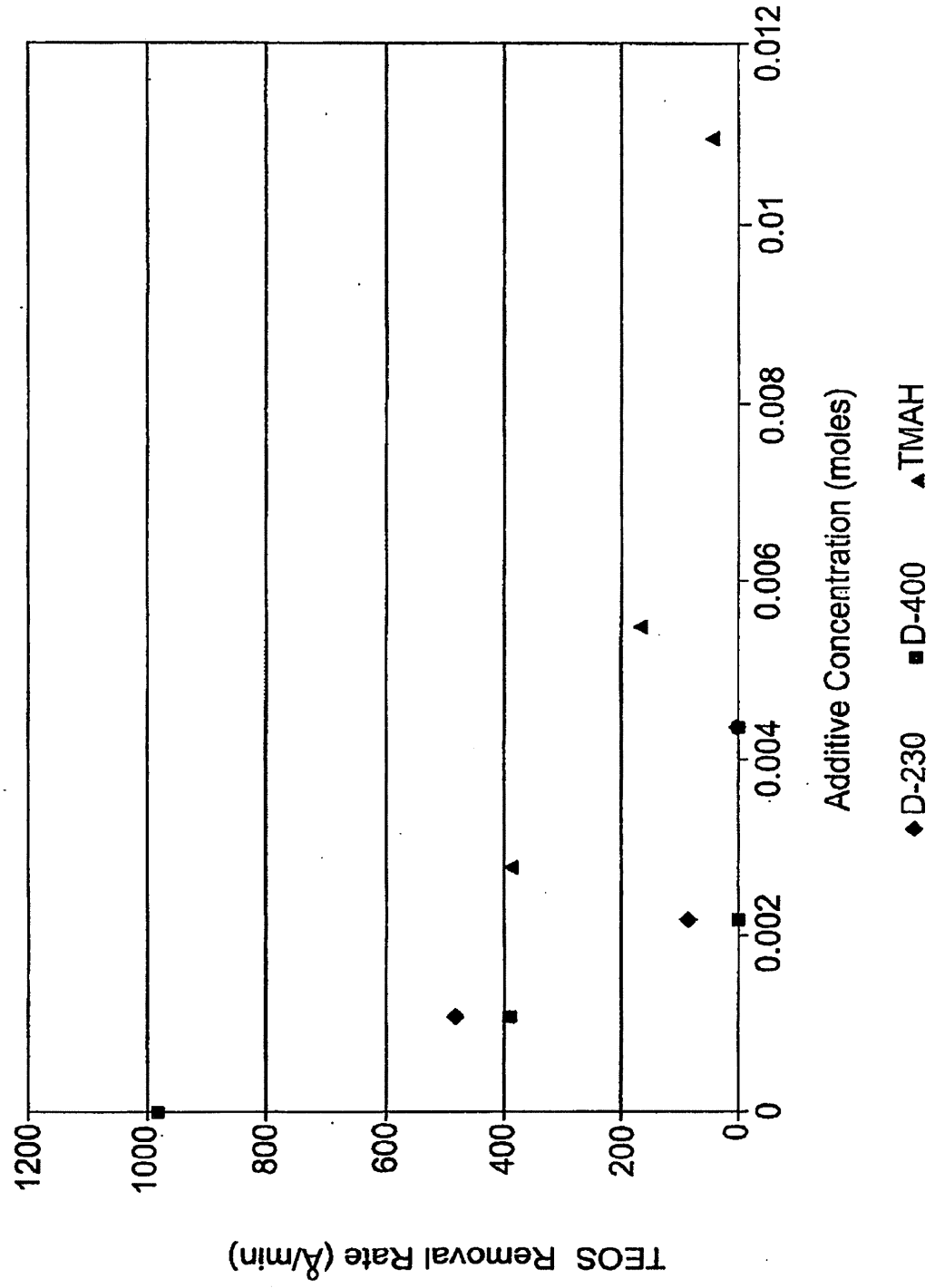

TEOS Removal Rate (Å/min)
1200
1000
800
600
400
200
0
0
0.002
0.004
0.006
0.008
0.01
0.012
Additive Concentration (moles)
◆D-230
■D-400
▲TMAH

FIG. 10

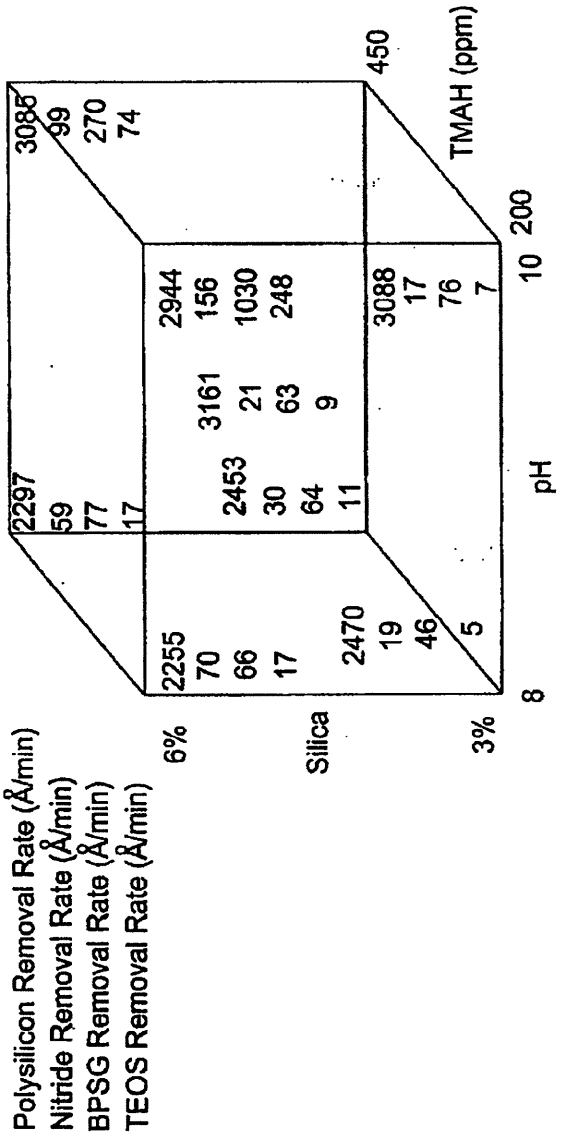

Polysilicon Removal Rate (Å/min)
Nitride Removal Rate (Å/min)
BPSG Removal Rate (Å/min)
TEOS Removal Rate (Å/min)
6%
3%
Silica
8
10
pH
200
450
TMAH (ppm)
2297
59
77
17
3085
99
270
74
2255
70
66
17
2453
30
64
11
3161
21
63
9
2944
156
1030
248
2470
19
46
5
3088
17
76
7

FIG. 11

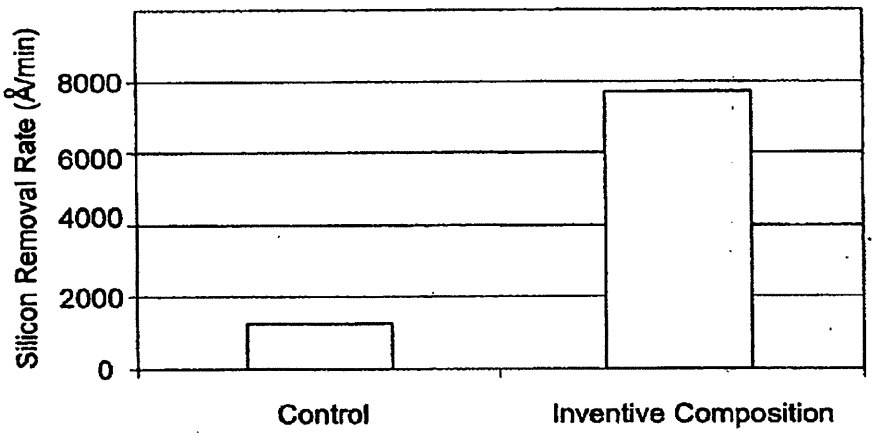
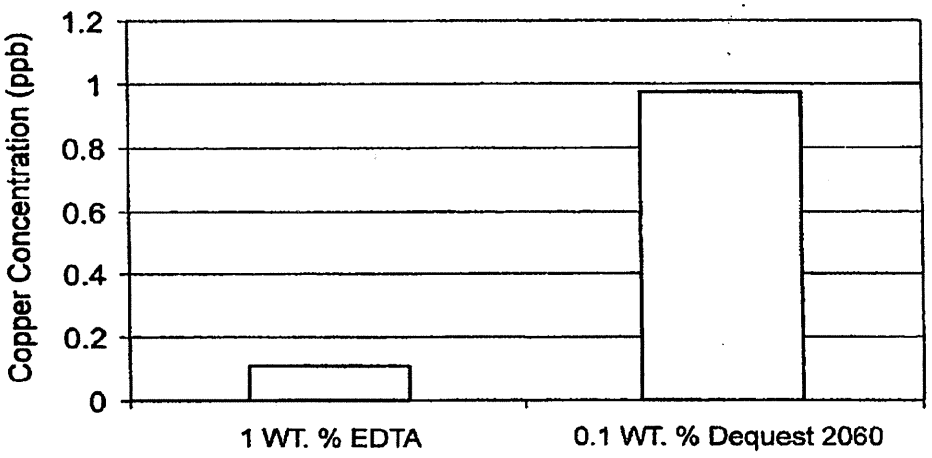

Silicon Removal Rate (Å/min)
8000
6000
4000
2000
0
Control
Inventive Composition

FIG. 12


Copper Concentration (ppb)
1.2
1
0.8
0.6
0.4
0.2
0
1 WT. % EDTA
0.1 WT. % Dequest 2060