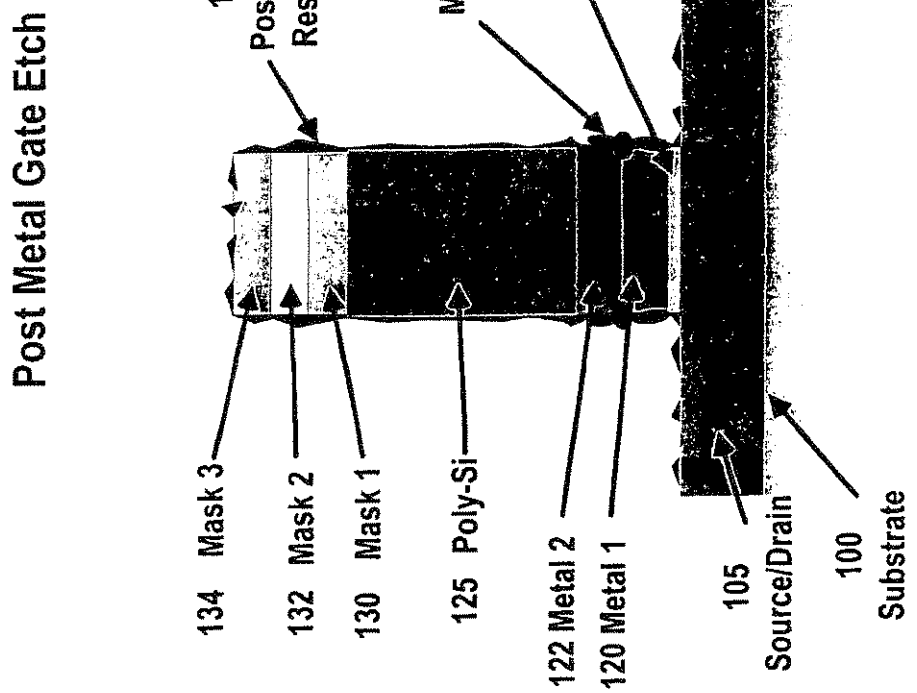


Figure 1

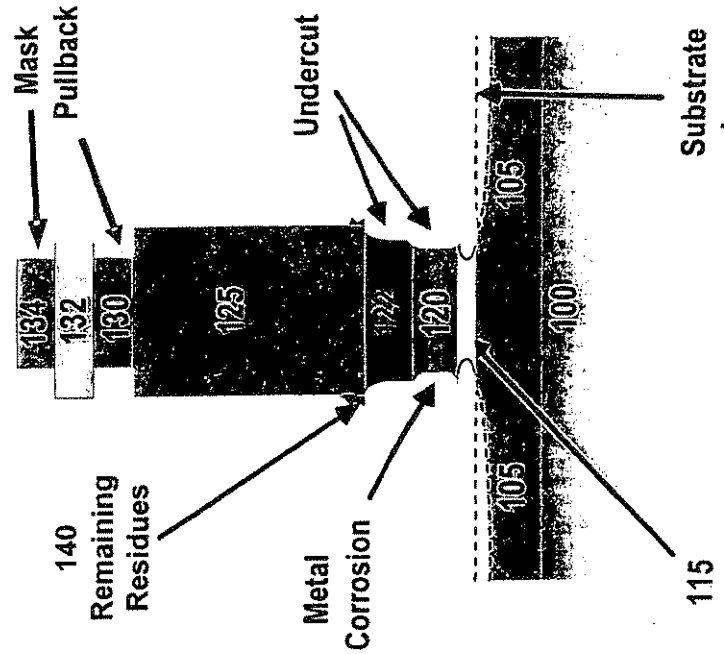


Figure 2

Desired Clean Result

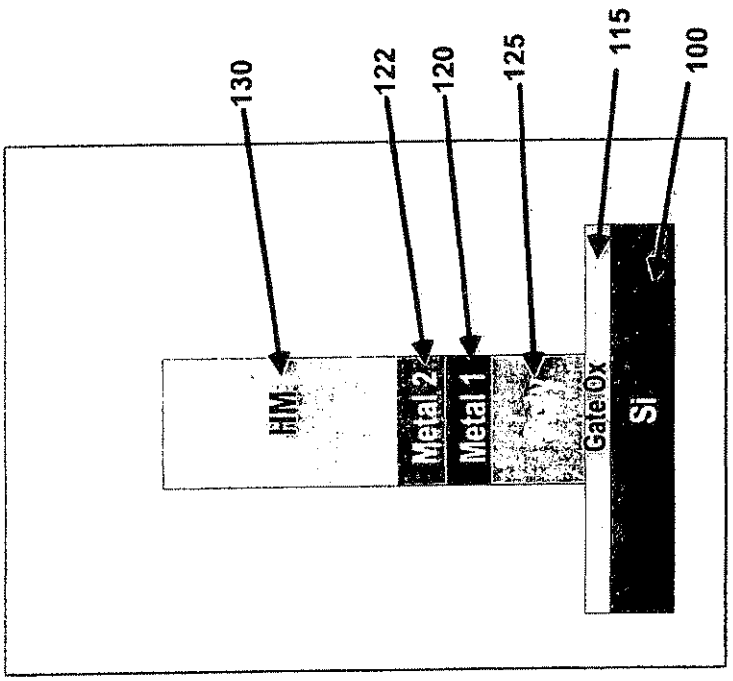


Figure 4A

DRAM gate structure/
Post Full Etch

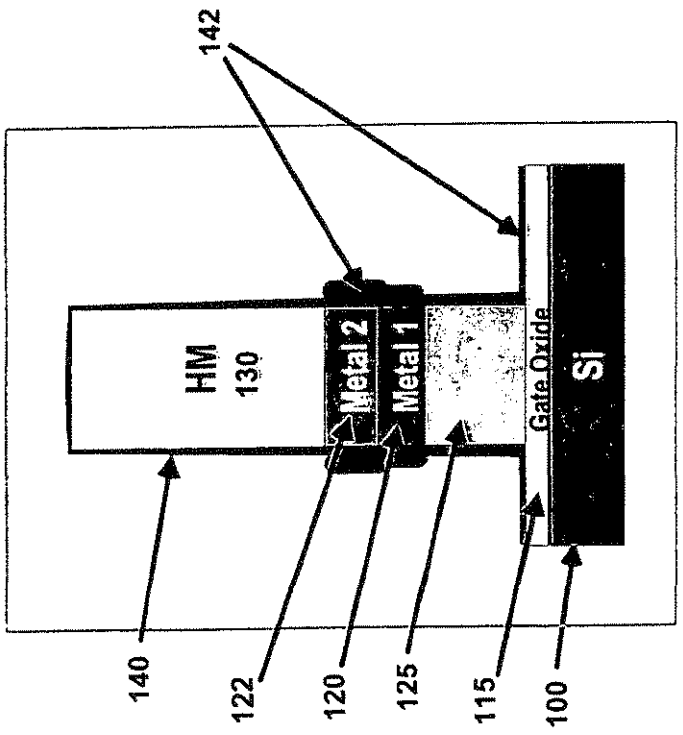


Figure 3A

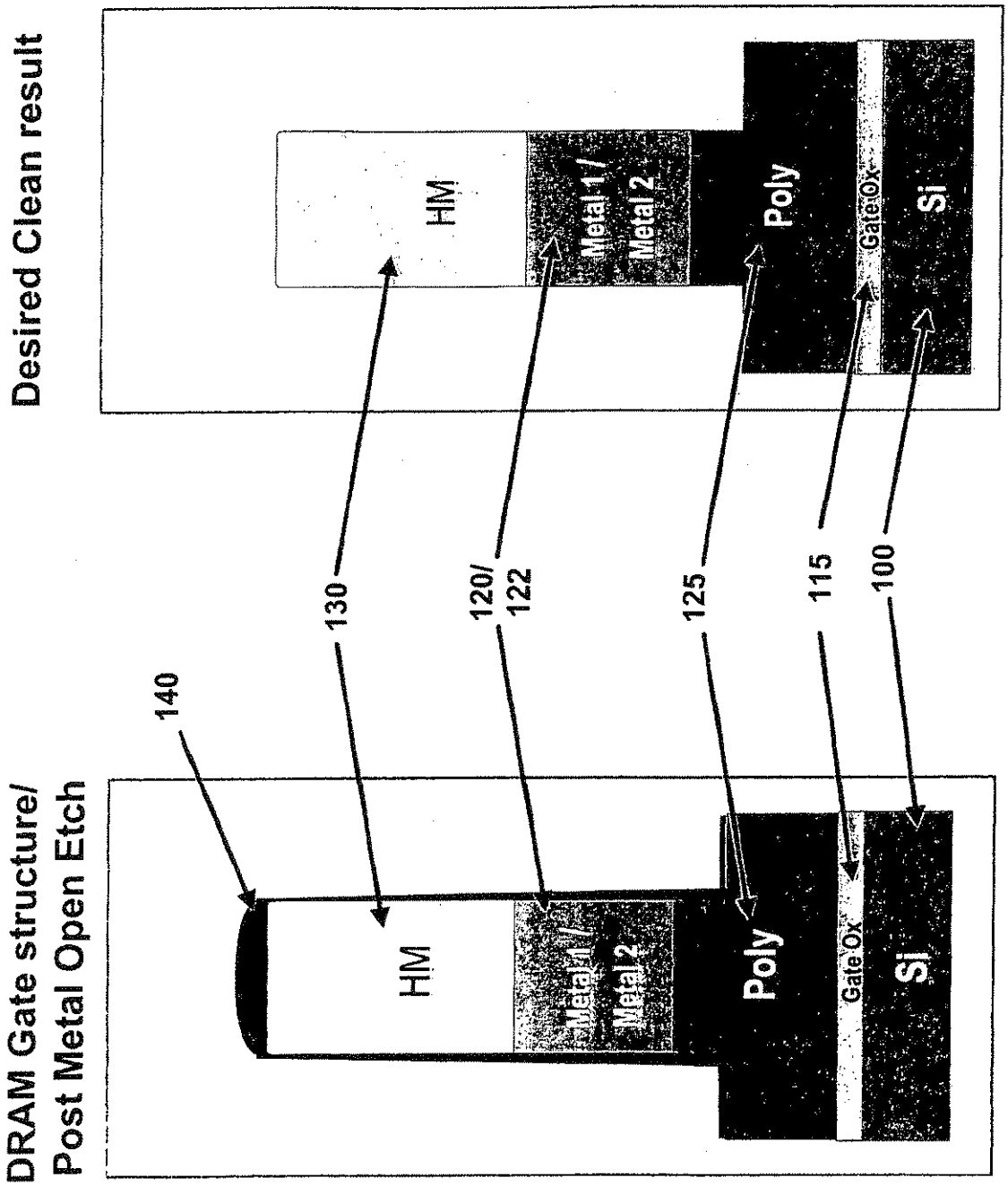


Figure 3B

Figure 4B

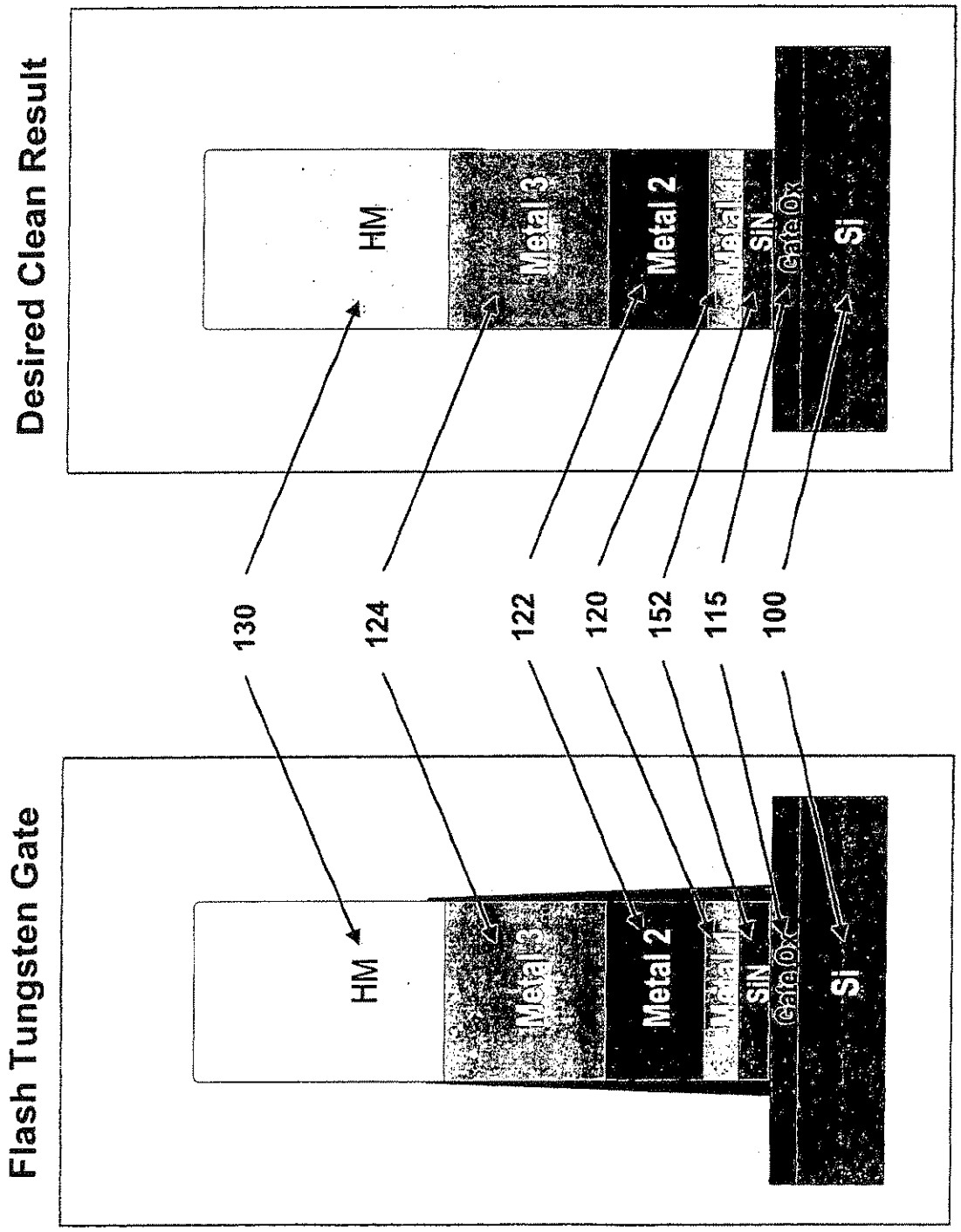


Figure 4C

Figure 3C

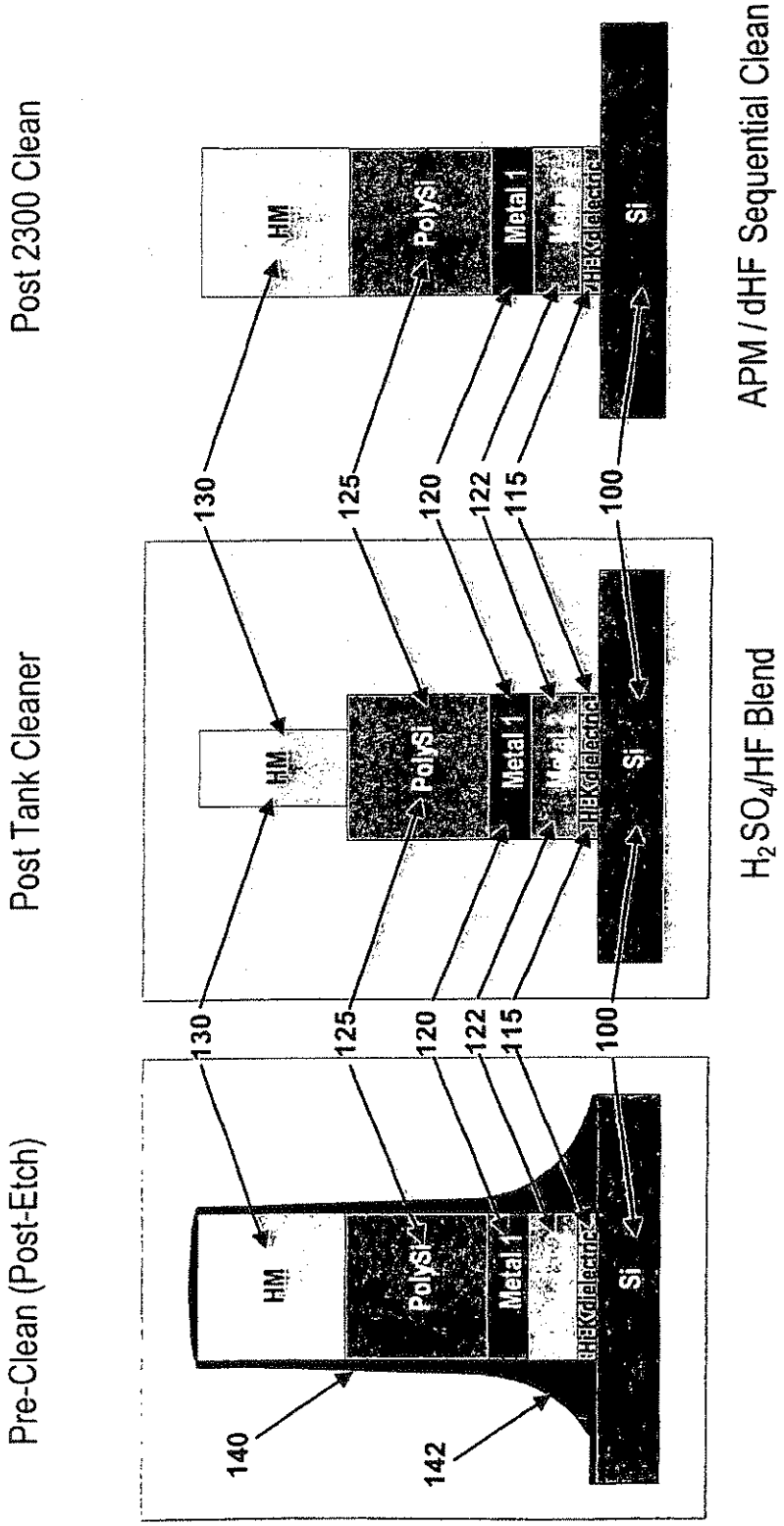


Figure 3D Figure 3E Figure 4D

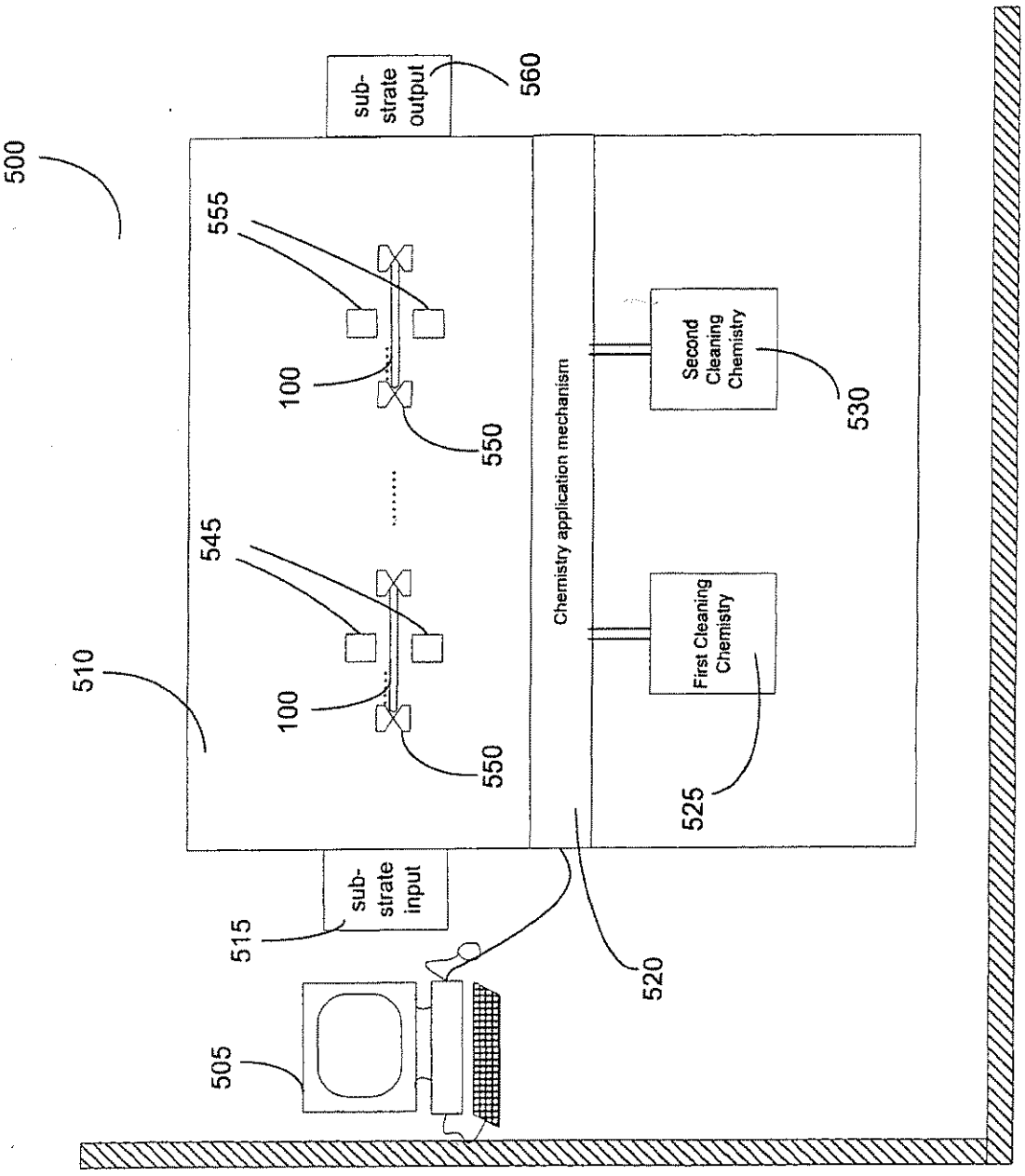

500
sub-strate output
560
555
100
550
545
100
550
510
Chemistry application mechanism
Second Cleaning Chemistry
530
First Cleaning Chemistry
525
sub-strate input
515
520
505

Figure 5

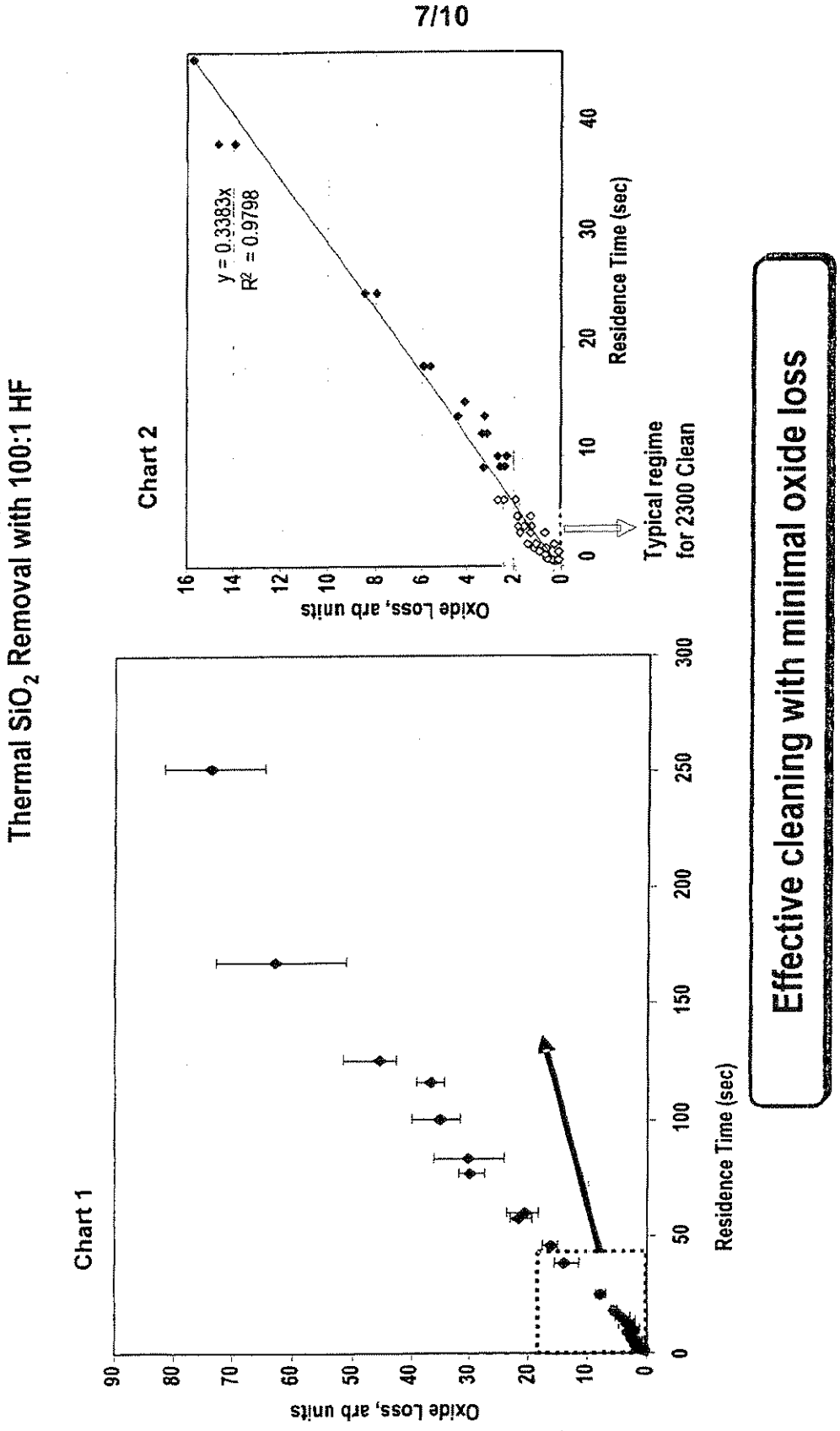


Figure 6A

Figure 6B

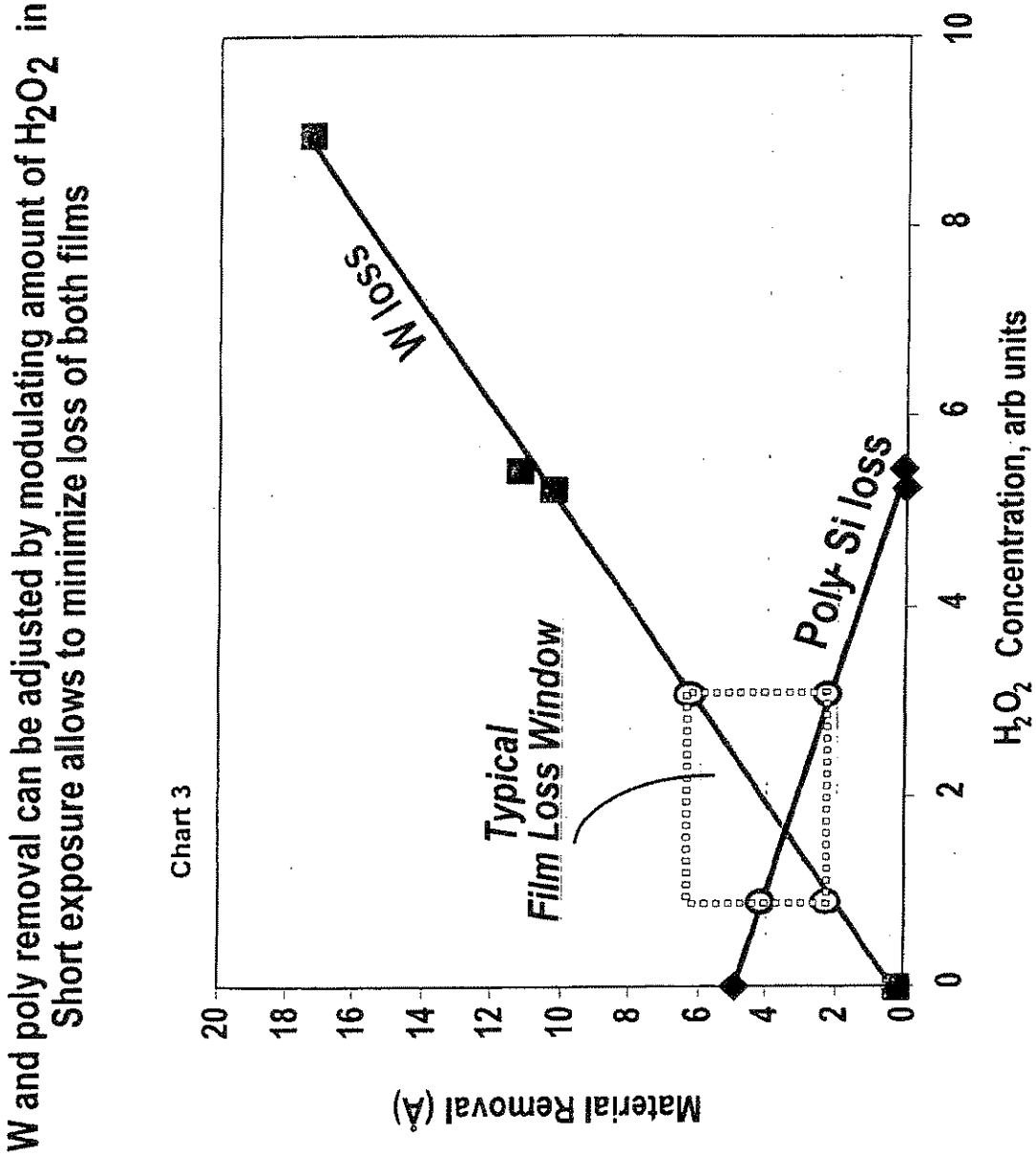

W and poly removal can be adjusted by modulating amount of H_2O_2 in APM
Short exposure allows to minimize loss of both films
Chart 3
Material Removal (Å)
20
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
H_2O_2 Concentration, arb units
W loss
Poly-Si loss
Typical
Film Loss Window

Figure 7

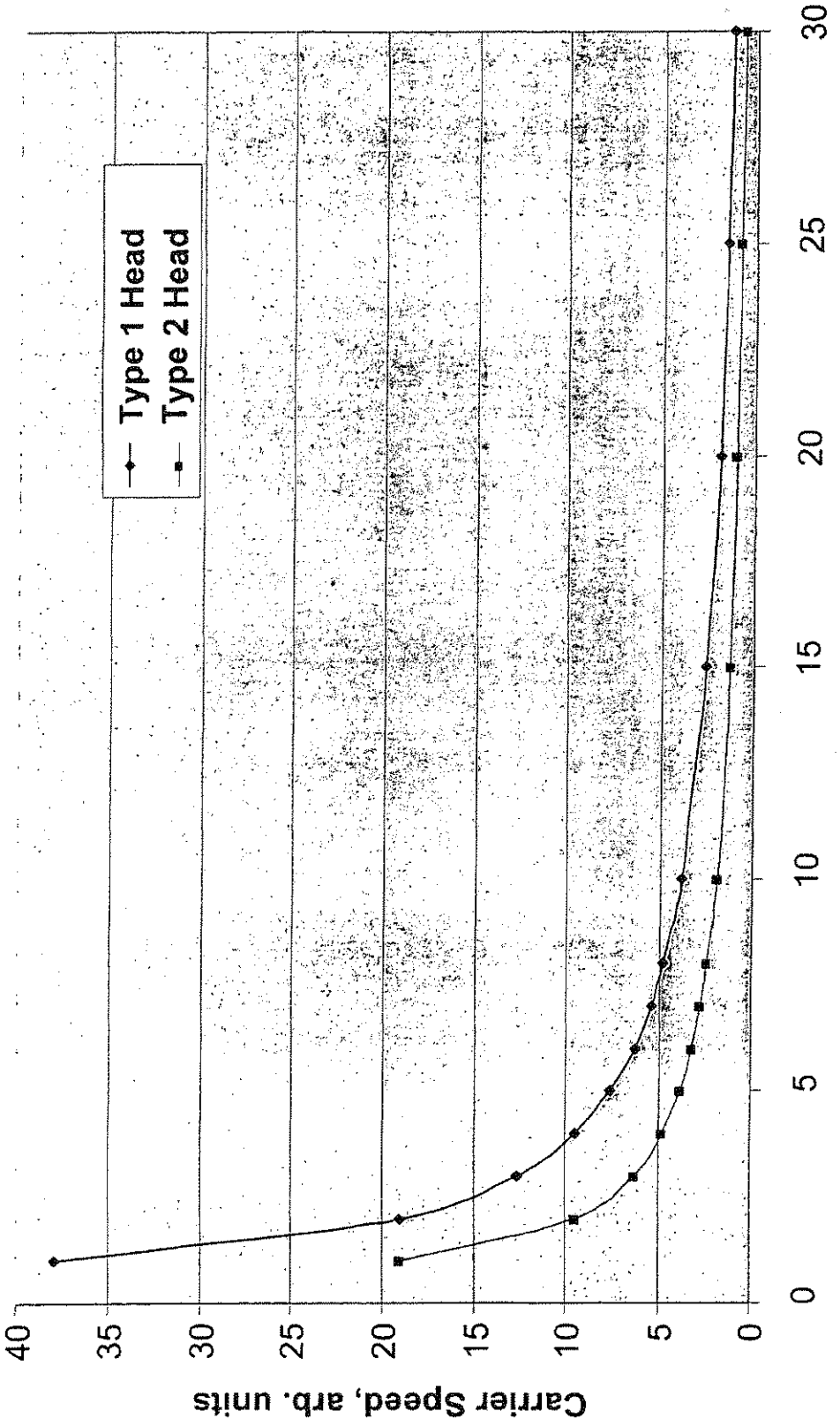

Type 1 Head
Type 2 Head
Carrier Speed, arb. units
Exposure Time, arb. units
0
5
10
15
20
25
30
35
40

Figure 8

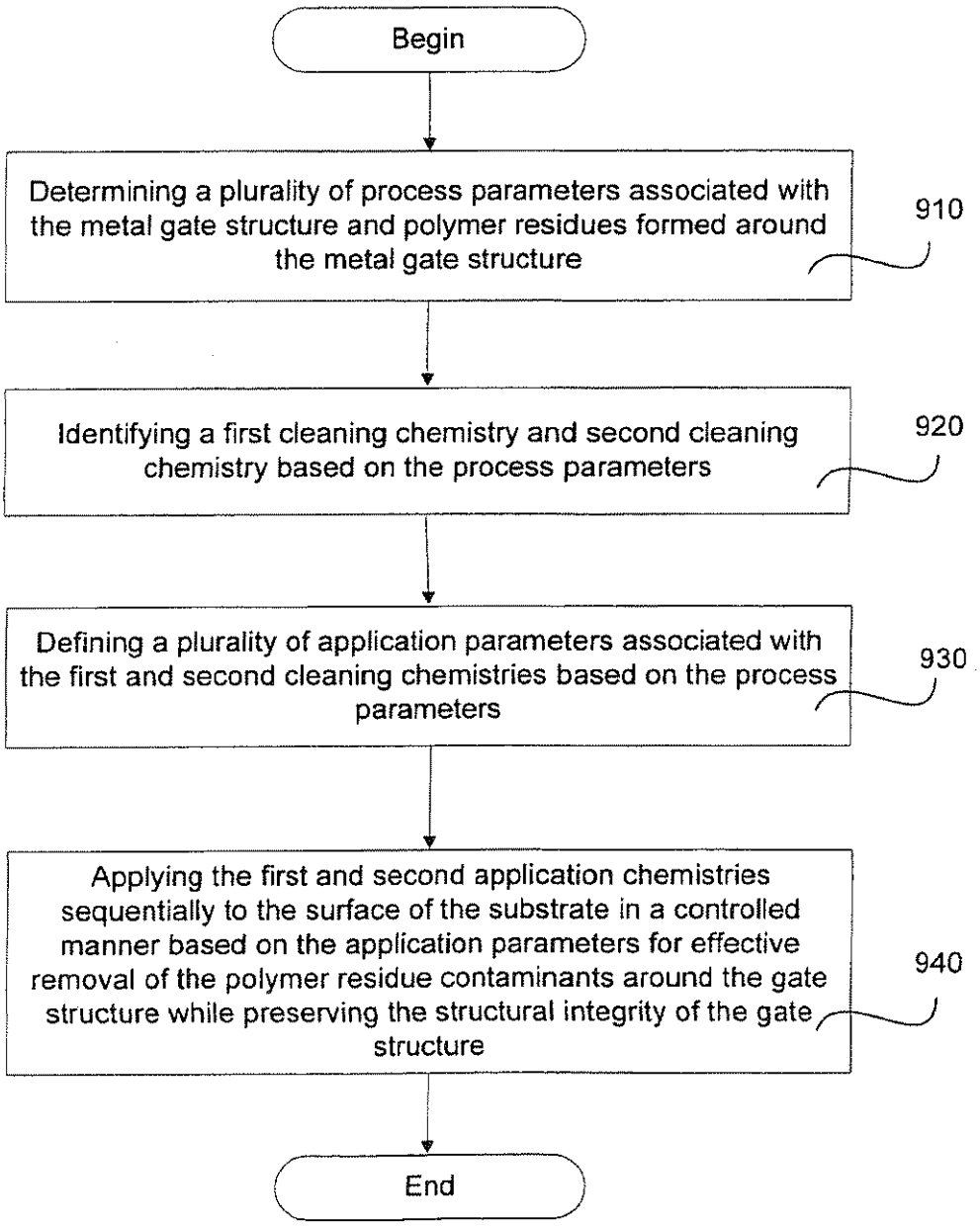

Begin
Determining a plurality of process parameters associated with the metal gate structure and polymer residues formed around the metal gate structure
910
Identifying a first cleaning chemistry and second cleaning chemistry based on the process parameters
920
Defining a plurality of application parameters associated with the first and second cleaning chemistries based on the process parameters
930
Applying the first and second application chemistries sequentially to the surface of the substrate in a controlled manner based on the application parameters for effective removal of the polymer residue contaminants around the gate structure while preserving the structural integrity of the gate structure
940
End

Figure 9