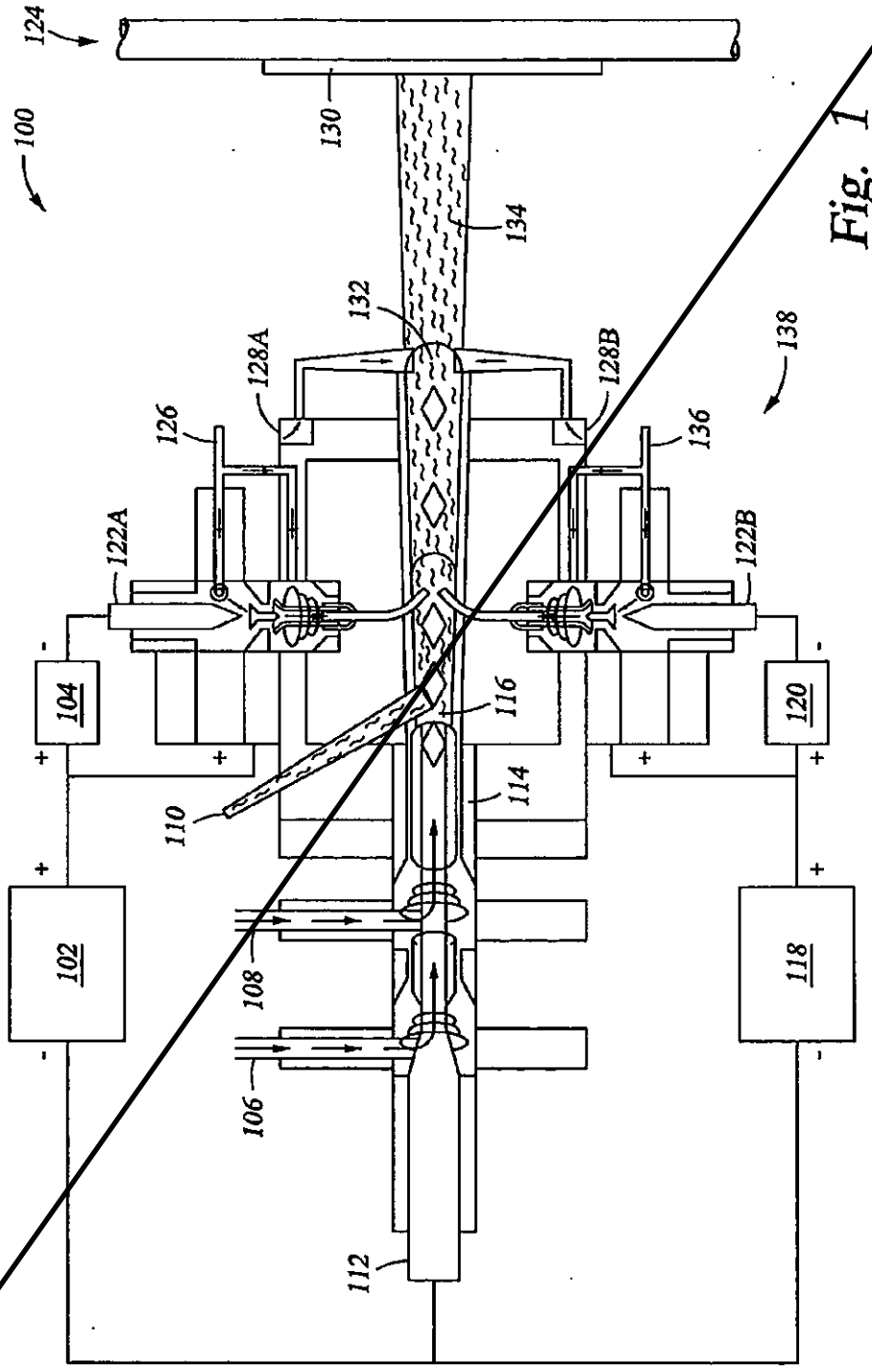


Fig. 1
(PRIOR ART)

Fig. 2A
(PRIOR ART)

Fig. 2B
(PRIOR ART)

Fig. 2C
(PRIOR ART)

Fig. 2D

Fig. 2E

Fig. 2F

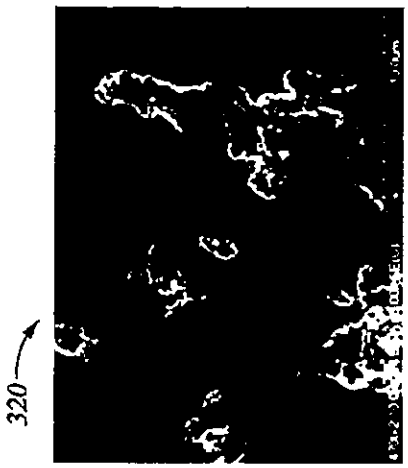


Fig. 3C



Fig. 3B



Fig. 3A



Fig. 3F



Fig. 3E



Fig. 3D

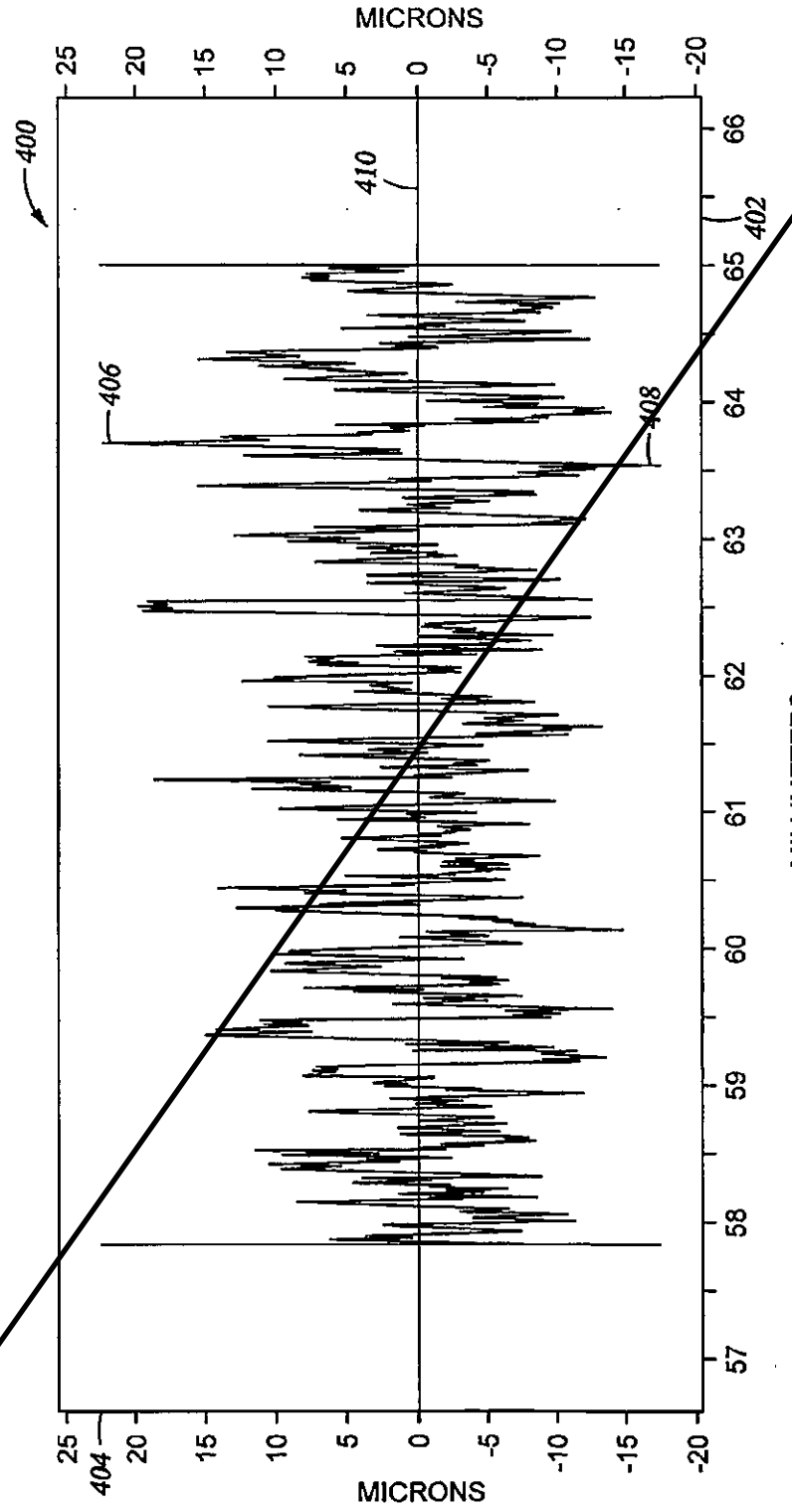


Fig. 4A
(PRIOR ART)

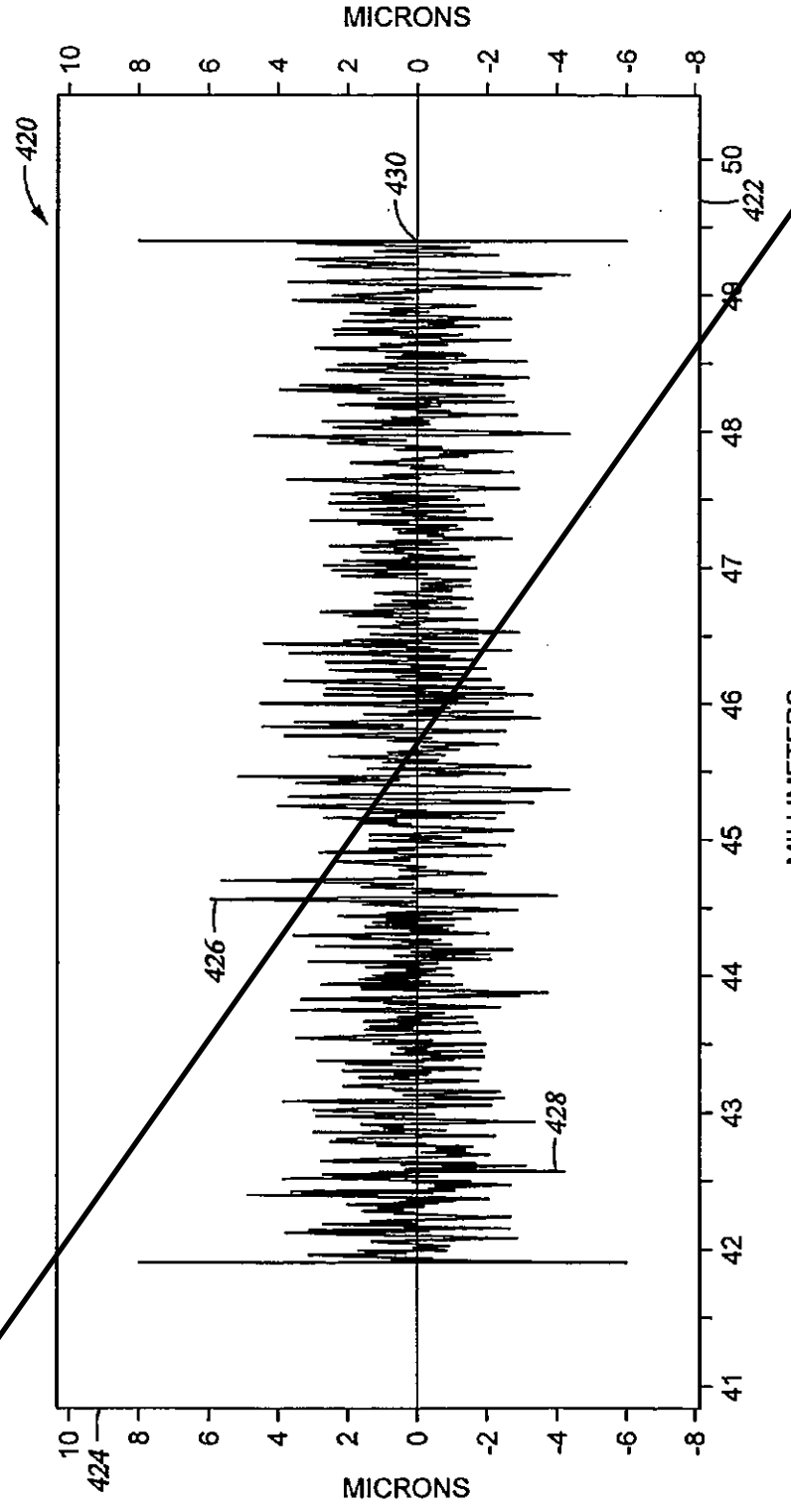

MICRONS
10
8
6
4
2
0
-2
-4
-6
-8
420
430
422
50
49
48
47
46
45
44
43
42
41
MILLIMETERS
426
428
424
MICRONS

Fig. 4B

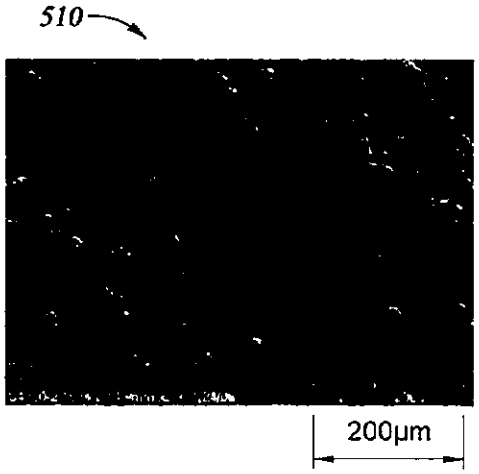


Fig. 5A

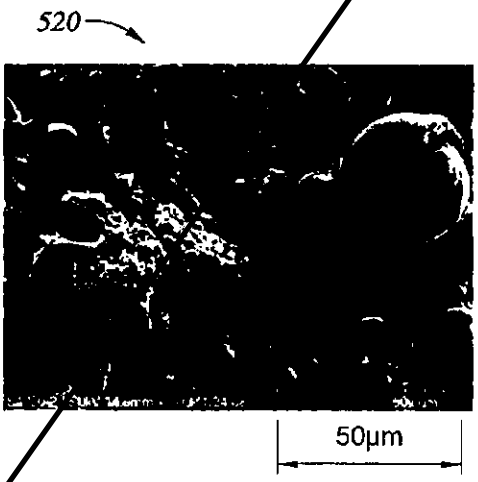


Fig. 5B

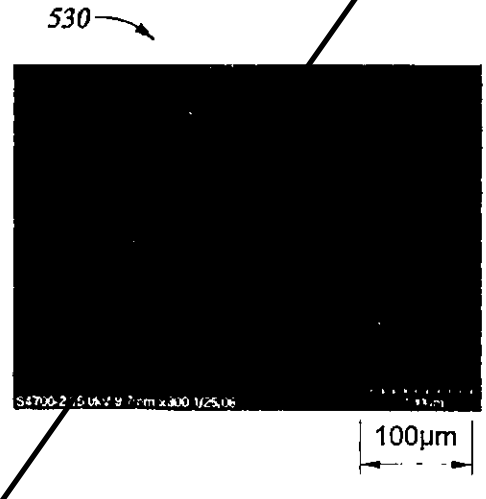


Fig. 5C

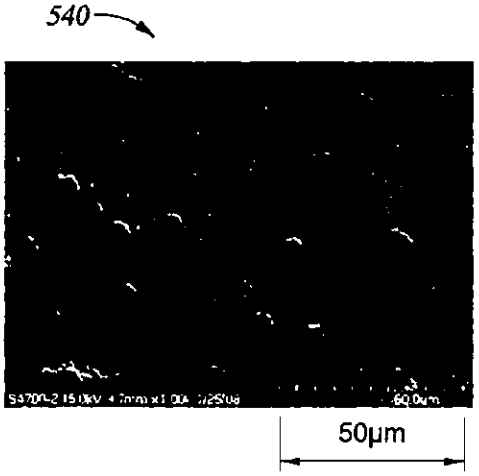


Fig. 5D

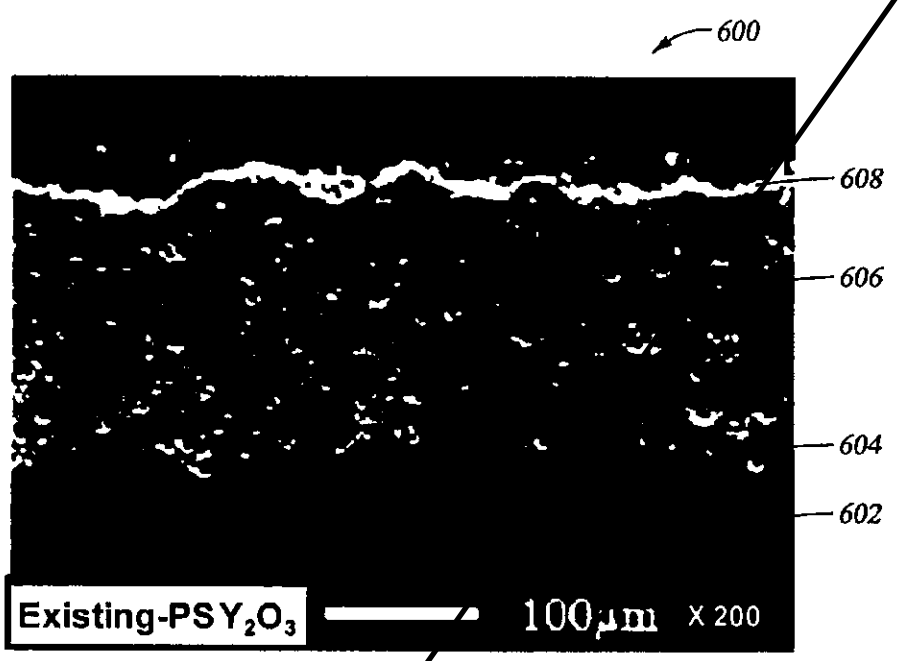

600
608
606
604
602
Existing-PS Y_2O_3
100μm X 200

Fig. 6A

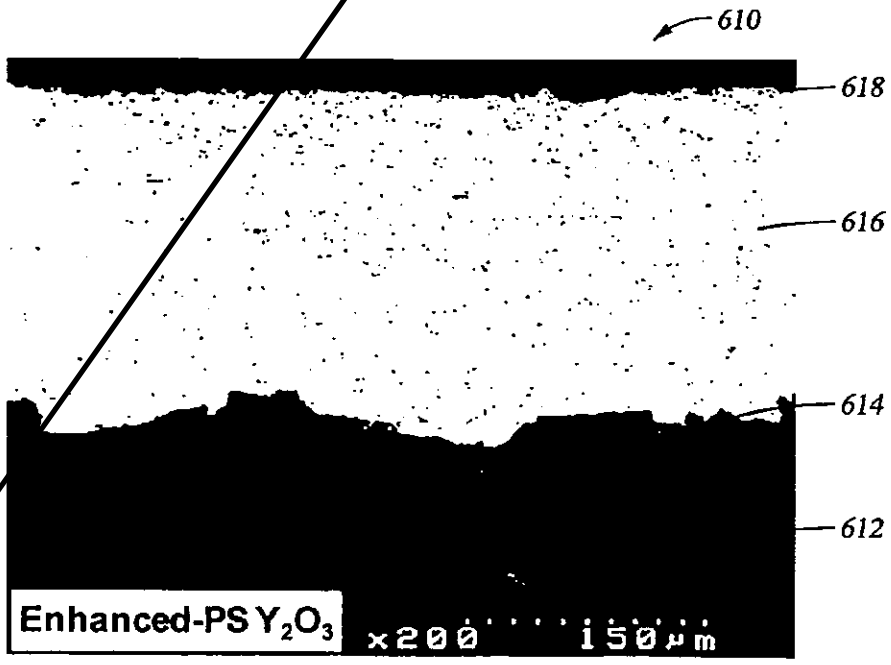

610
618
616
614
612
Enhanced-PS Y_2O_3
x200 150μm

Fig. 6B

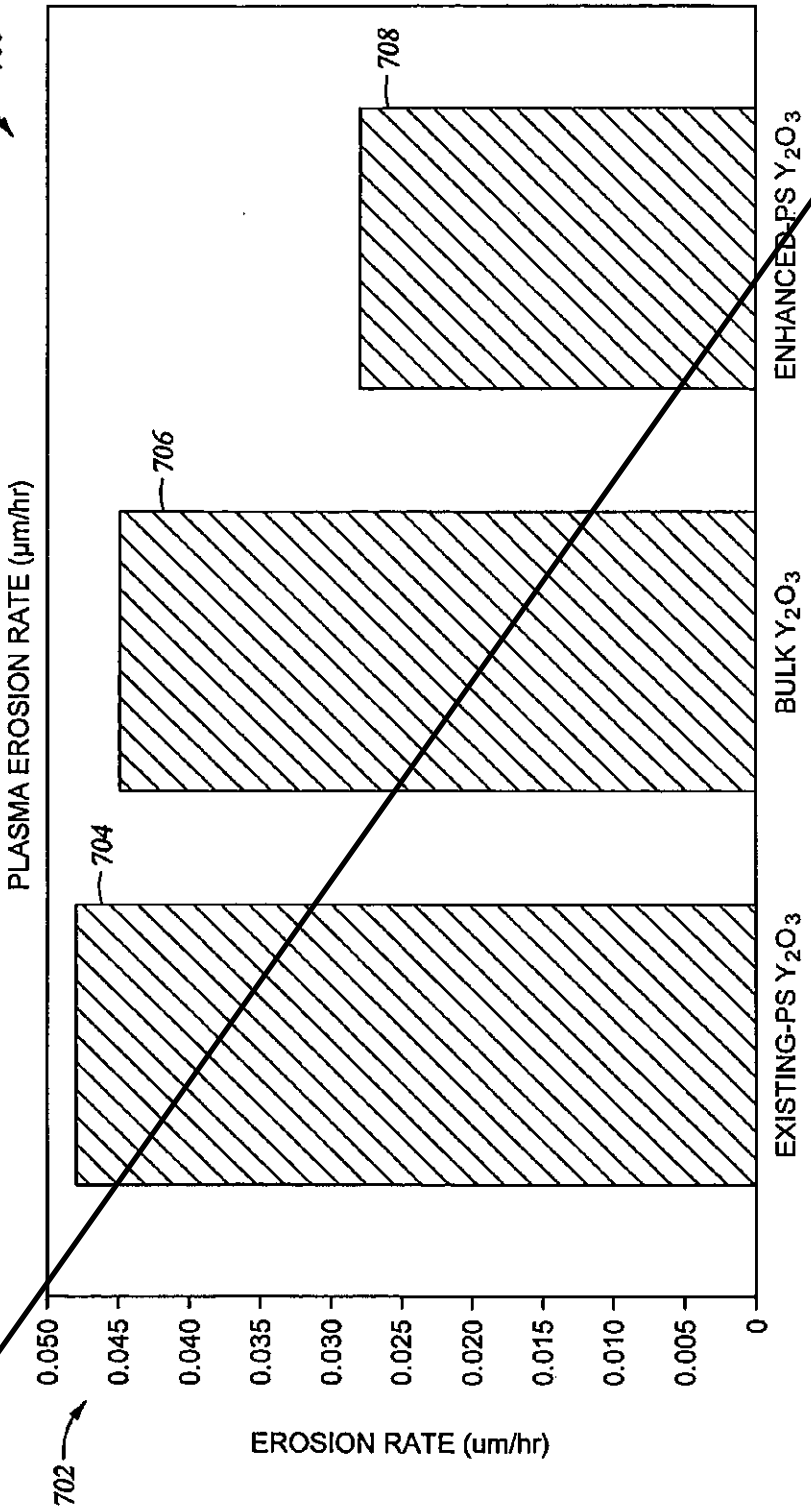

700
PLASMA EROSION RATE (μm/hr)
704
706
708
EXISTING-PS Y_2O_3
BULK Y_2O_3
ENHANCED-PS Y_2O_3
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0
EROSION RATE (um/hr)
702

Fig. 7A

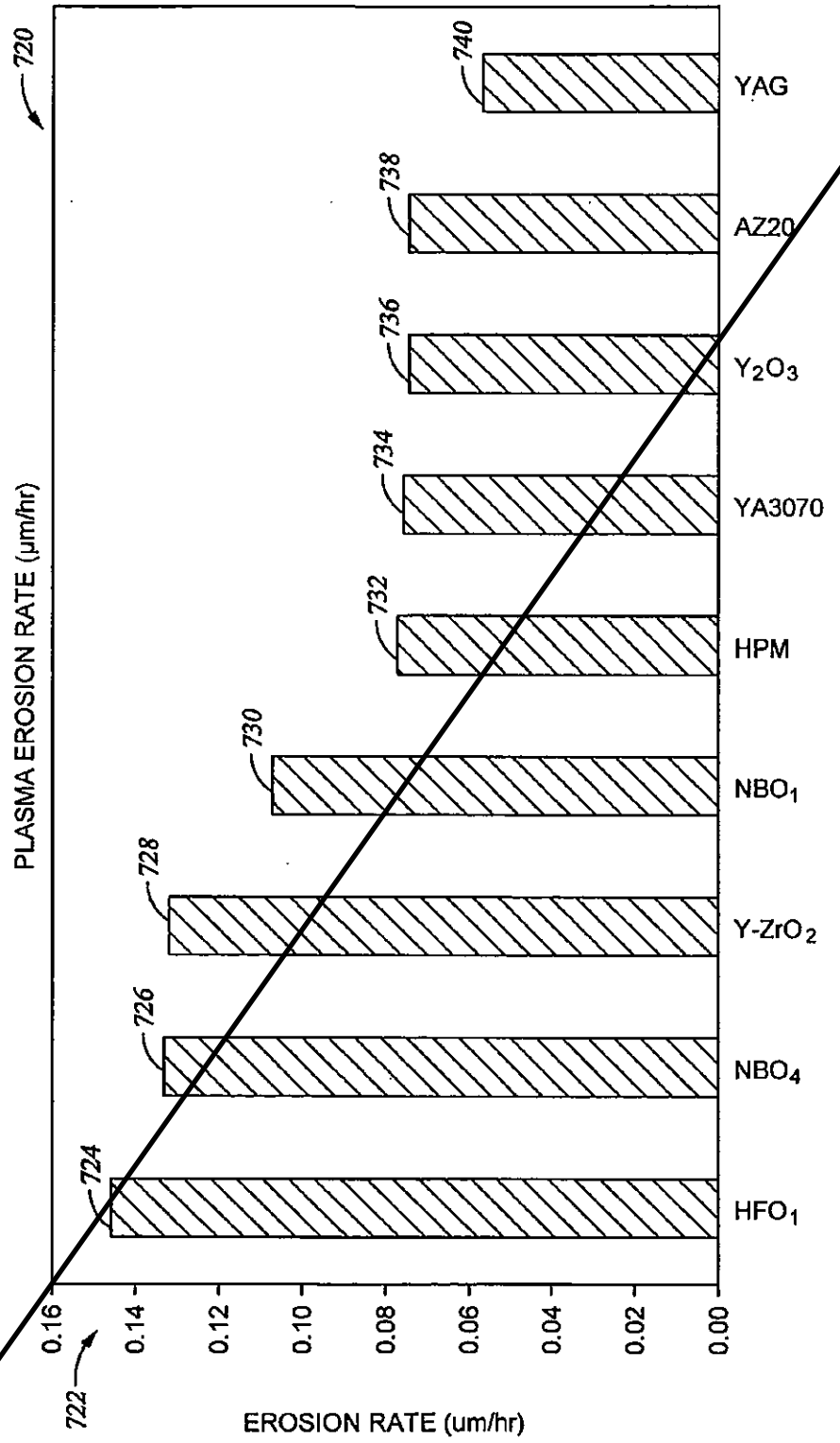

720
PLASMA EROSION RATE (μm/hr)
740
YAG
738
AZ20
736
Y_2O_3
734
YA3070
732
HPM
730
NBO_1
728
$Y\text{-}ZrO_2$
726
NBO_4
724
HFO_1
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
722
EROSION RATE (um/hr)

Fig. 7B

800

EROSION RATE AND CHEMICAL COMPOSITION OF DIFFERENT MATERIALS

NEW NAME	EROSION RATE (um/hr)	COMPOSITION
YAG	0.057	37.5mol% Y_2O_3 62.5mol% Al_2O_3
YZ20	0.074	73.2mol% Y_2O_3 26.8mol% ZrO_2
Y2O3	0.074	100mol% Y_2O_3
YA3070	0.076	8.5mol% Y_2O_3 91.5mol% Al_2O_3
HPM	0.077	63mol%Y_2O_3, 14mol% Al_2O_3, 23mol% ZrO_2
NBO1	0.107	70mol%Y_2O_3, 10mol% Nb_2O_5, 20mol% ZrO_2
Y-ZrO2	0.132	3mol% Y_2O_3, 97mol% ZrO_2
NBO4	0.133	60mol%Y_2O_3, 20mol% Nb_2O_5, 20mol% ZrO_2
HFO1	0.146	75mol%Y_2O_3, 20mol% HfO_2, and 5mol%ZrO_2

Fig. 8

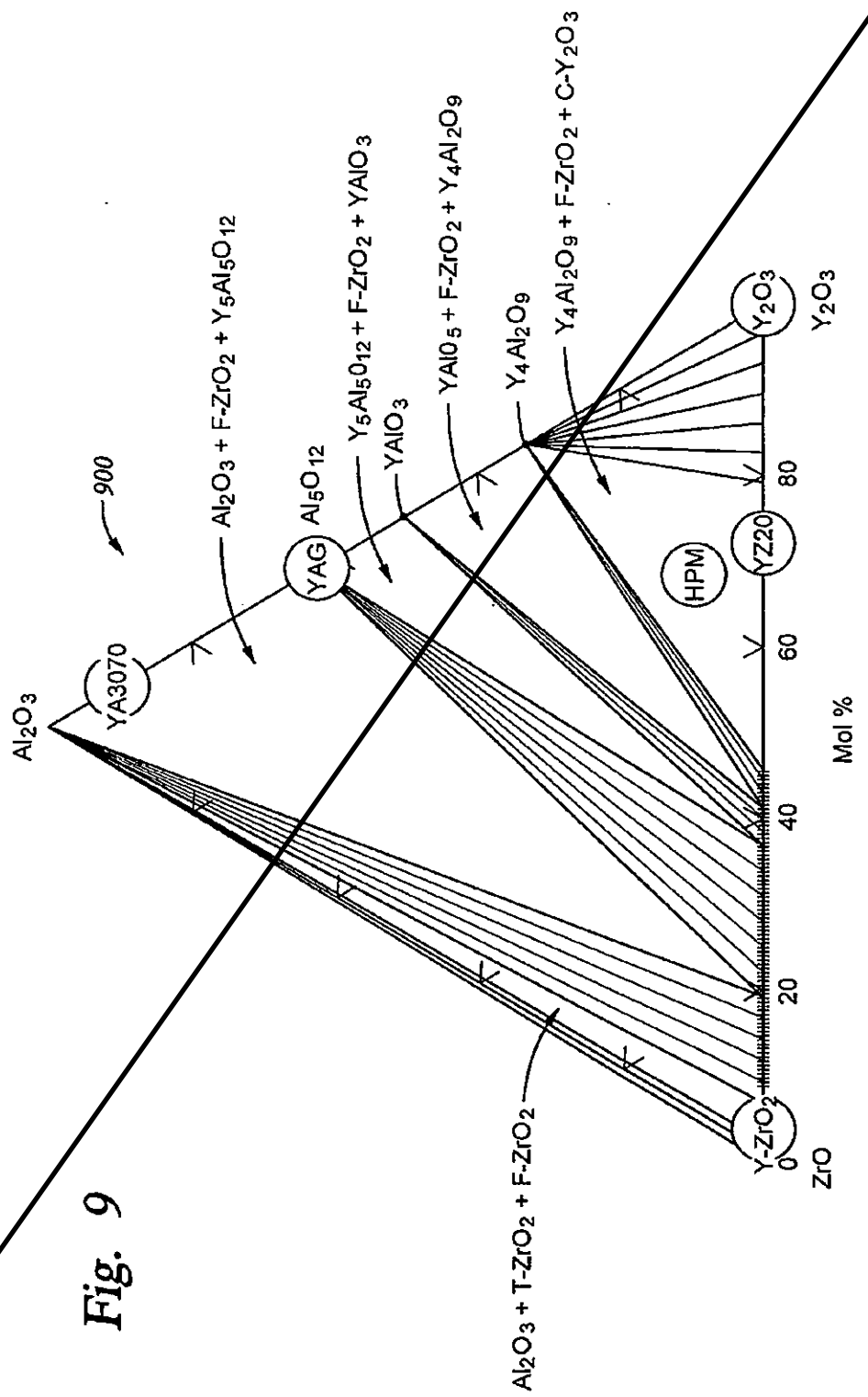

900
Al_2O_3
YA3070
$Al_2O_3 + F\text{-}ZrO_2 + Y_5Al_5O_{12}$
YAG
Al_5O_{12}
$Y_5Al_5O_{12} + F\text{-}ZrO_2 + YAlO_3$
$YAlO_3$
$YAlO_5 + F\text{-}ZrO_2 + Y_4Al_2O_9$
$Y_4Al_2O_9$
$Y_4Al_2O_9 + F\text{-}ZrO_2 + C\text{-}Y_2O_3$
Y_2O_3
Y_2O_3
HPM
YZ20
$Al_2O_3 + T\text{-}ZrO_2 + F\text{-}ZrO_2$
$Y\text{-}ZrO_2$
0
20
40
60
80
Mol %
ZrO

Fig. 9

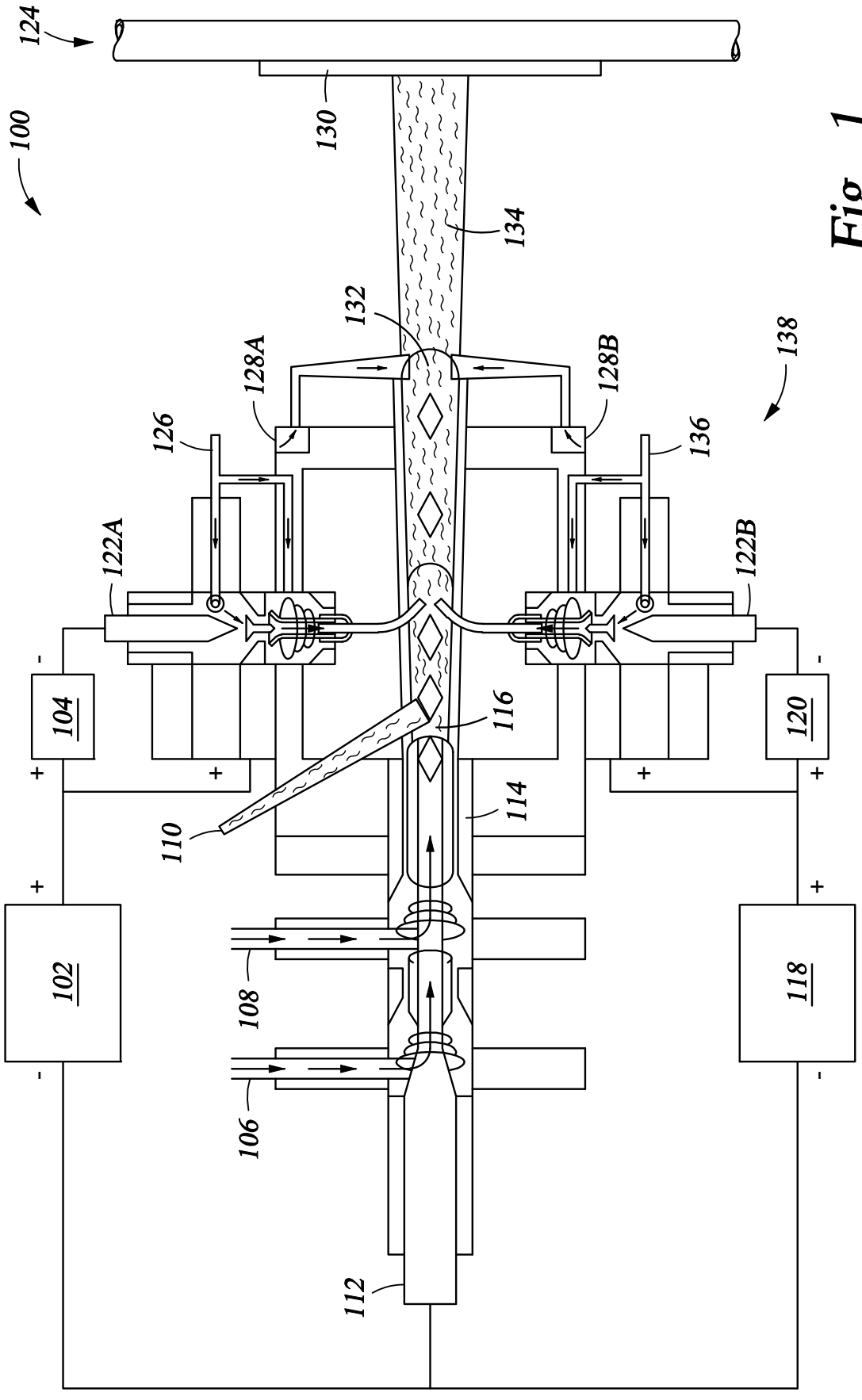


Fig. 1
(PRIOR ART)

200

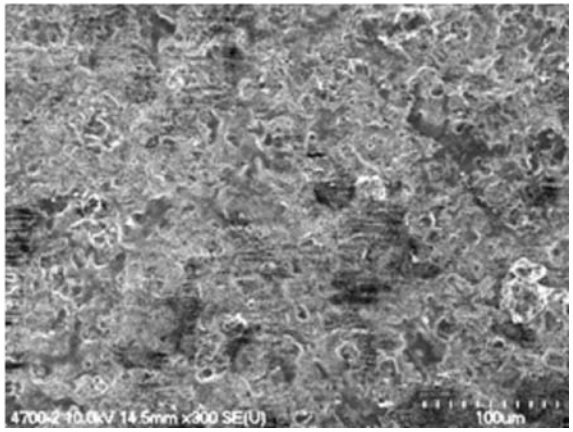


Fig. 2A
(PRIOR ART)

210

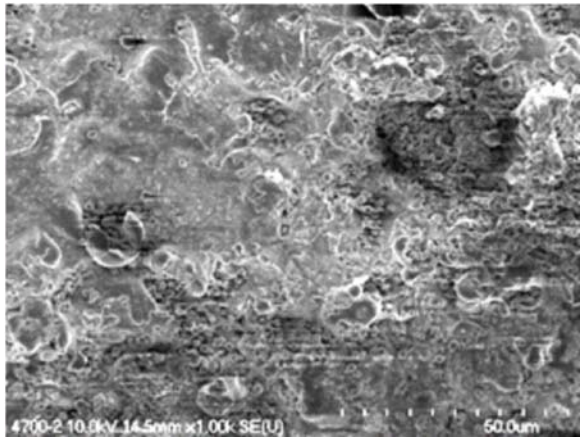


Fig. 2B
(PRIOR ART)

220

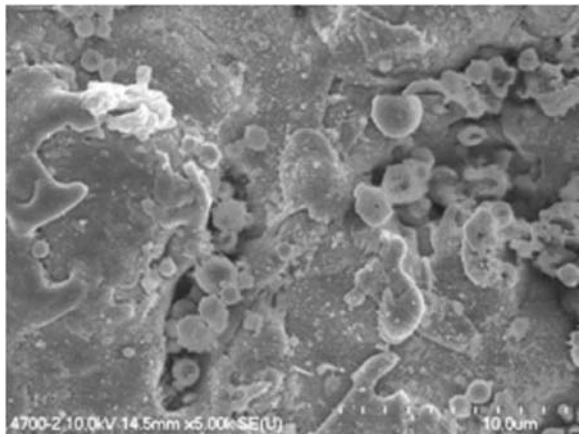


Fig. 2C
(PRIOR ART)

230

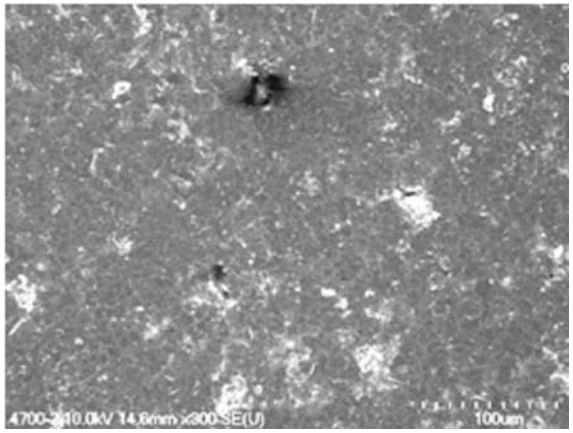


Fig. 2D

240

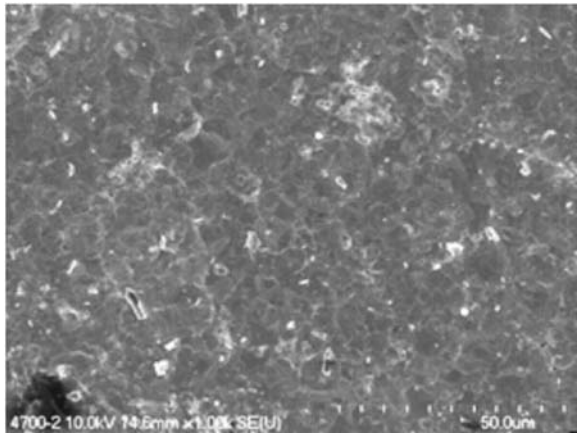


Fig. 2E

250

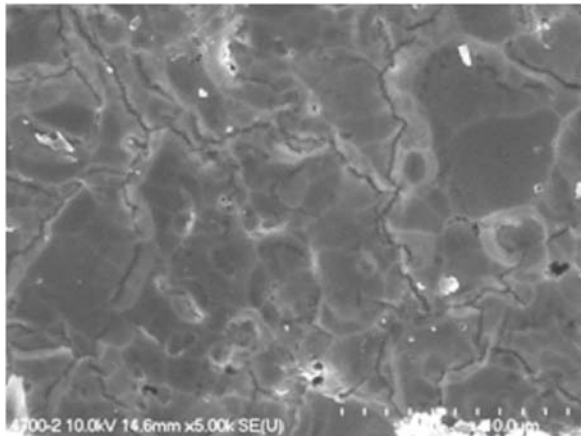


Fig. 2F

300

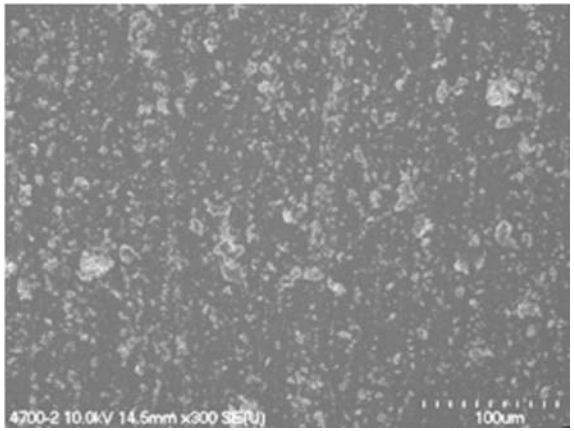


Fig. 3A

310

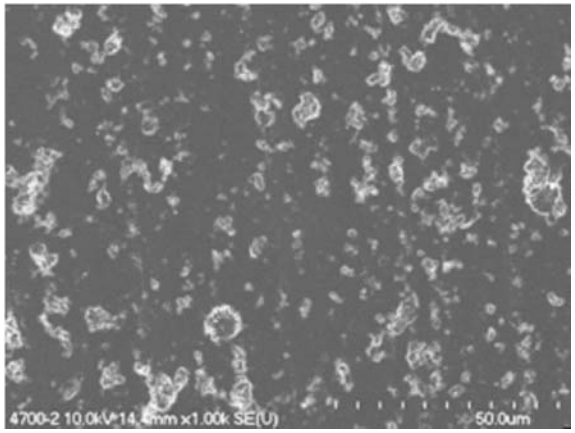


Fig. 3B

320

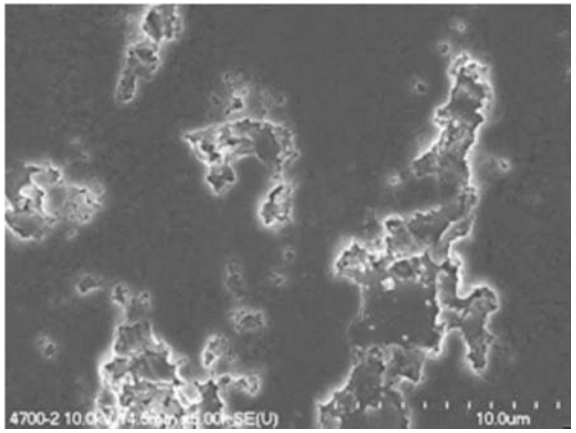


Fig. 3C

330

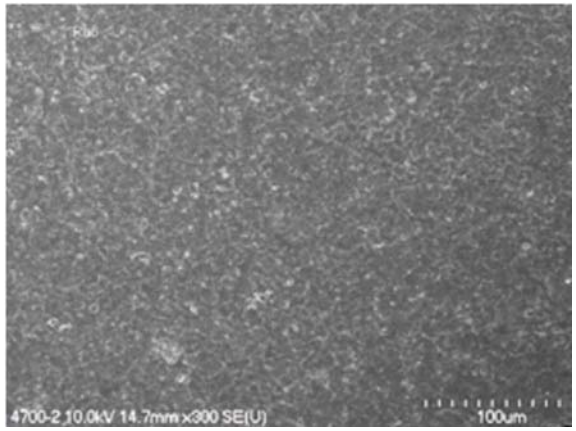


Fig. 3D

340

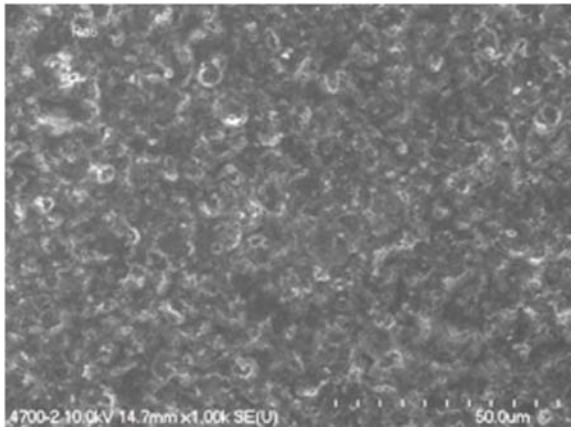


Fig. 3E

350

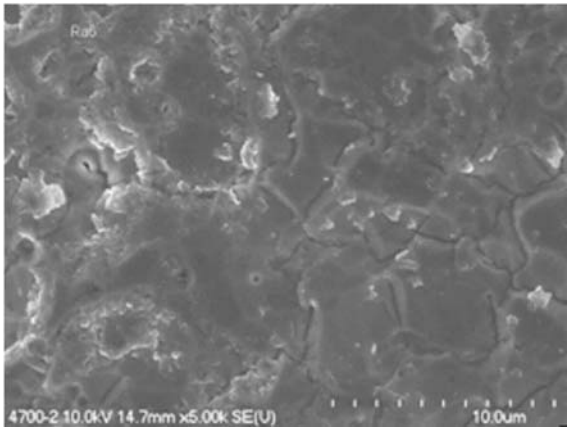


Fig. 3F

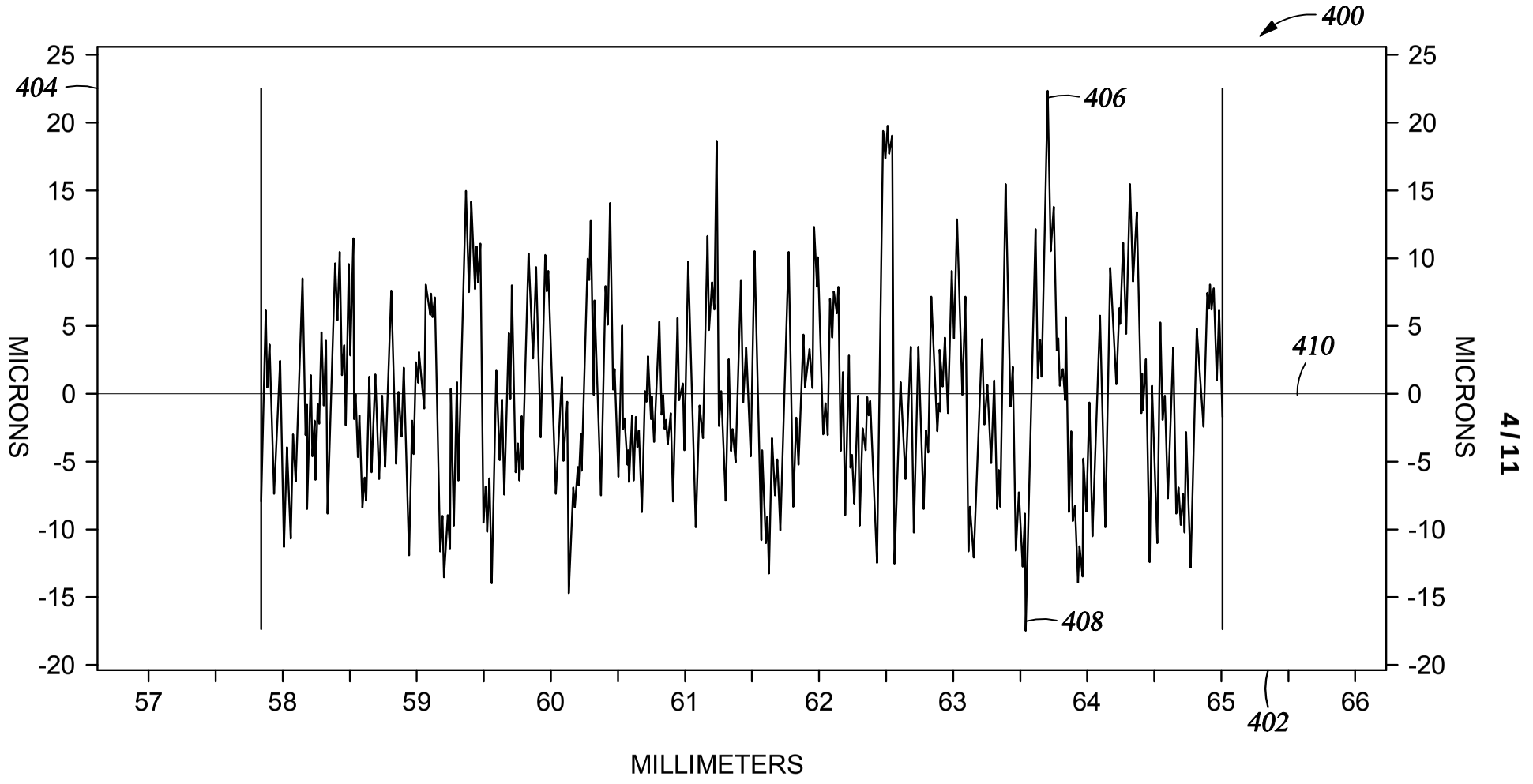


Fig. 4A

(PRIOR ART)

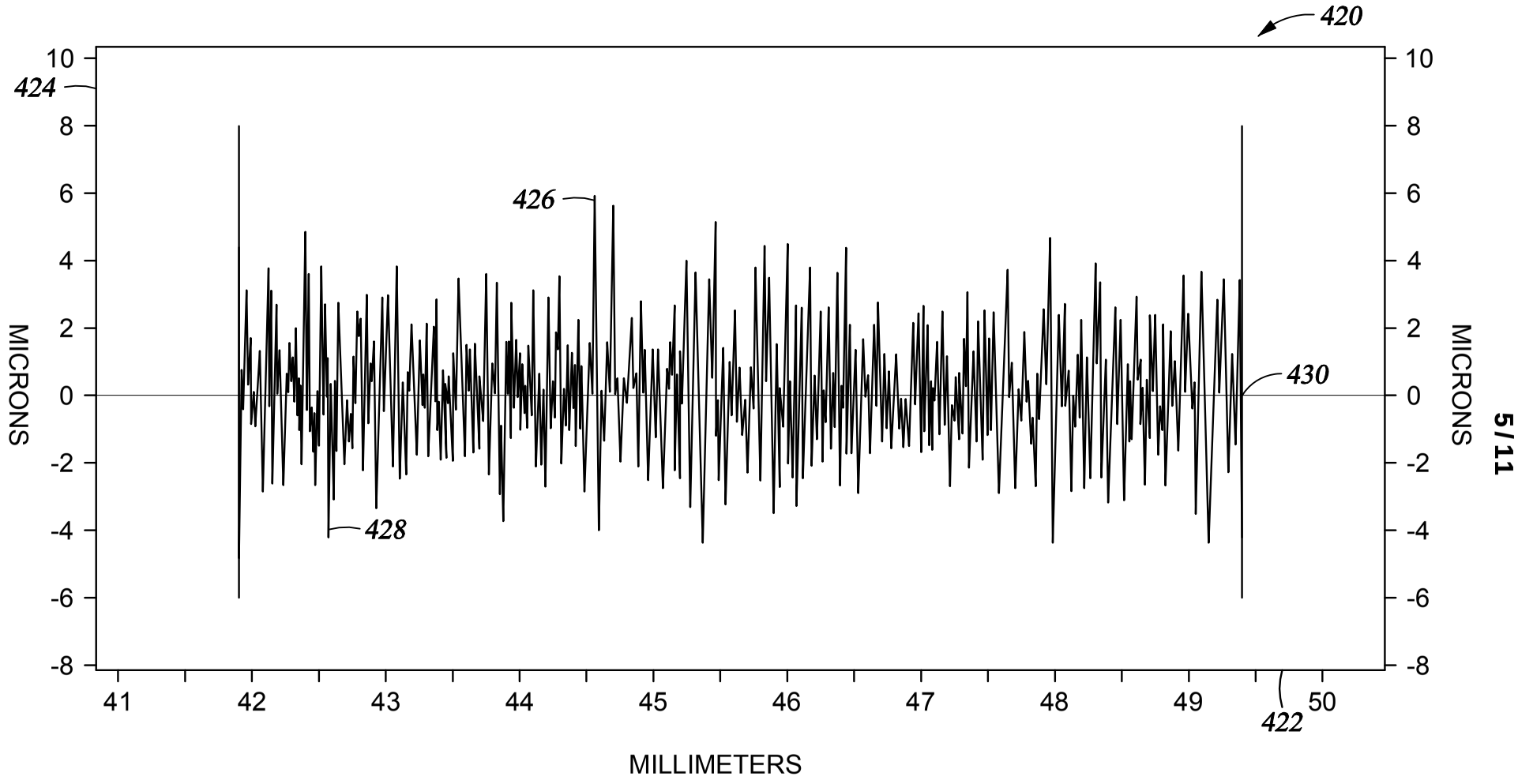

420
424
426
428
430
422
MICRONS
MICRONS
MILLIMETERS
10
8
6
4
2
0
-2
-4
-6
-8
41
42
43
44
45
46
47
48
49
50

Fig. 4B

510

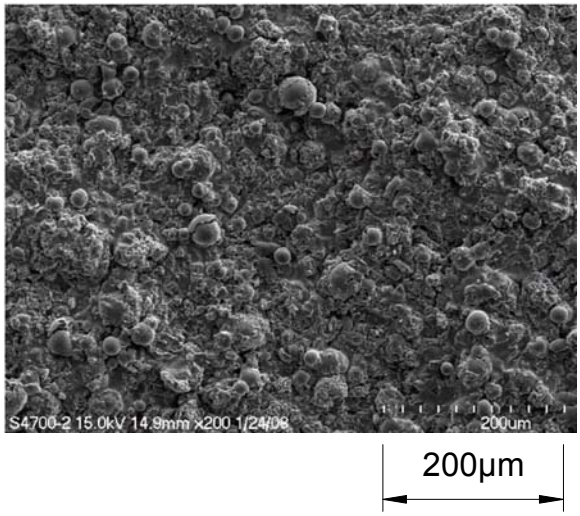


Fig. 5A

520

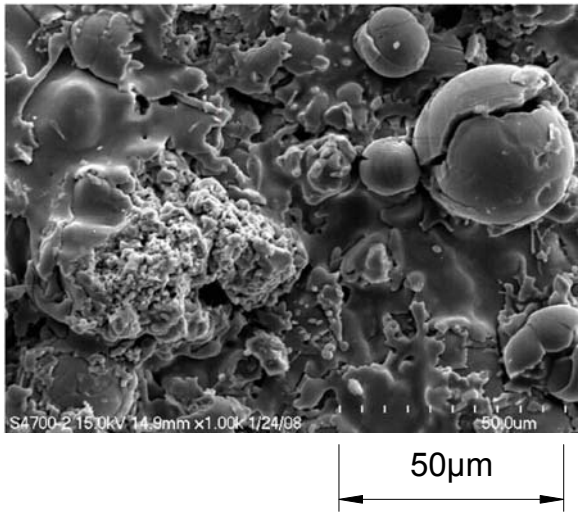


Fig. 5B

530

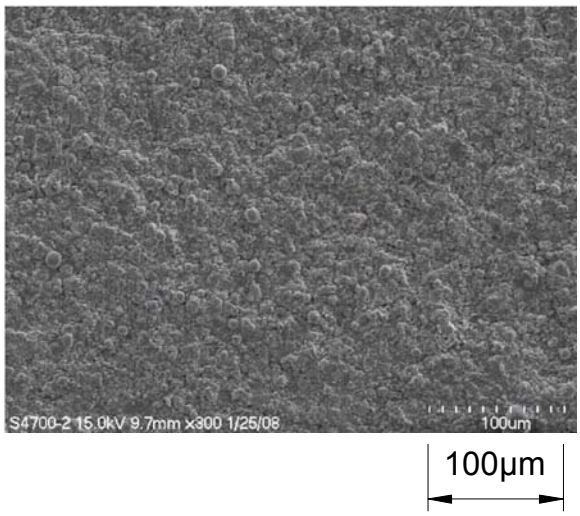


Fig. 5C

540

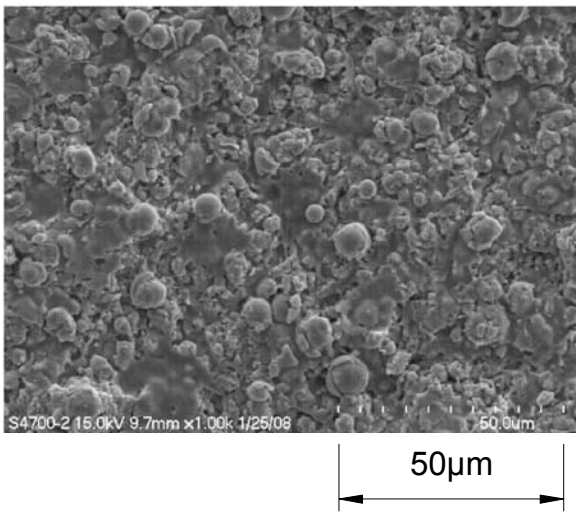


Fig. 5D

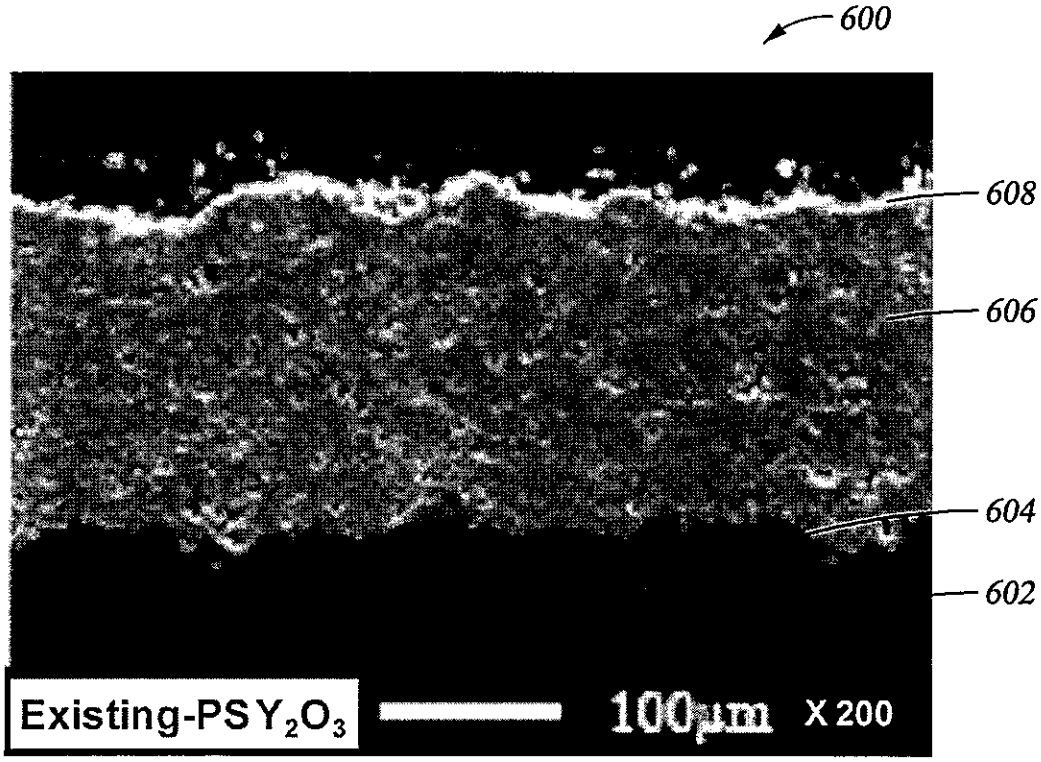

600
608
606
604
602
Existing-PS Y_2O_3
100µm X 200

Fig. 6A

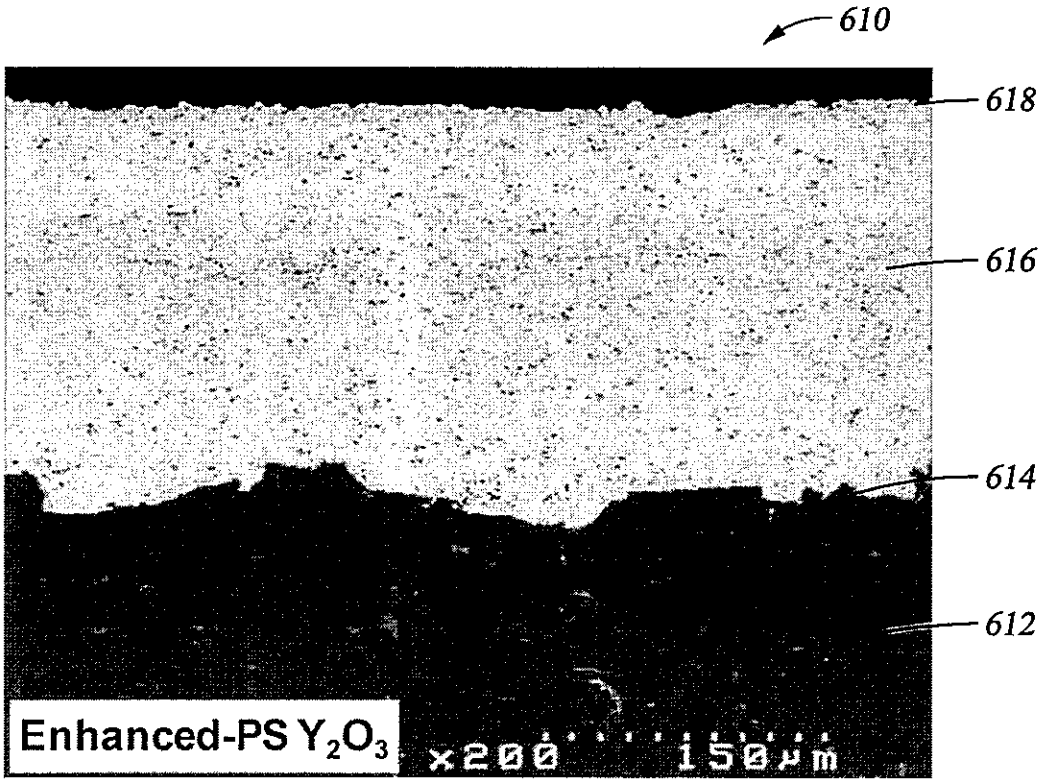

610
618
616
614
612
Enhanced-PS Y_2O_3
x200 150µm

Fig. 6B

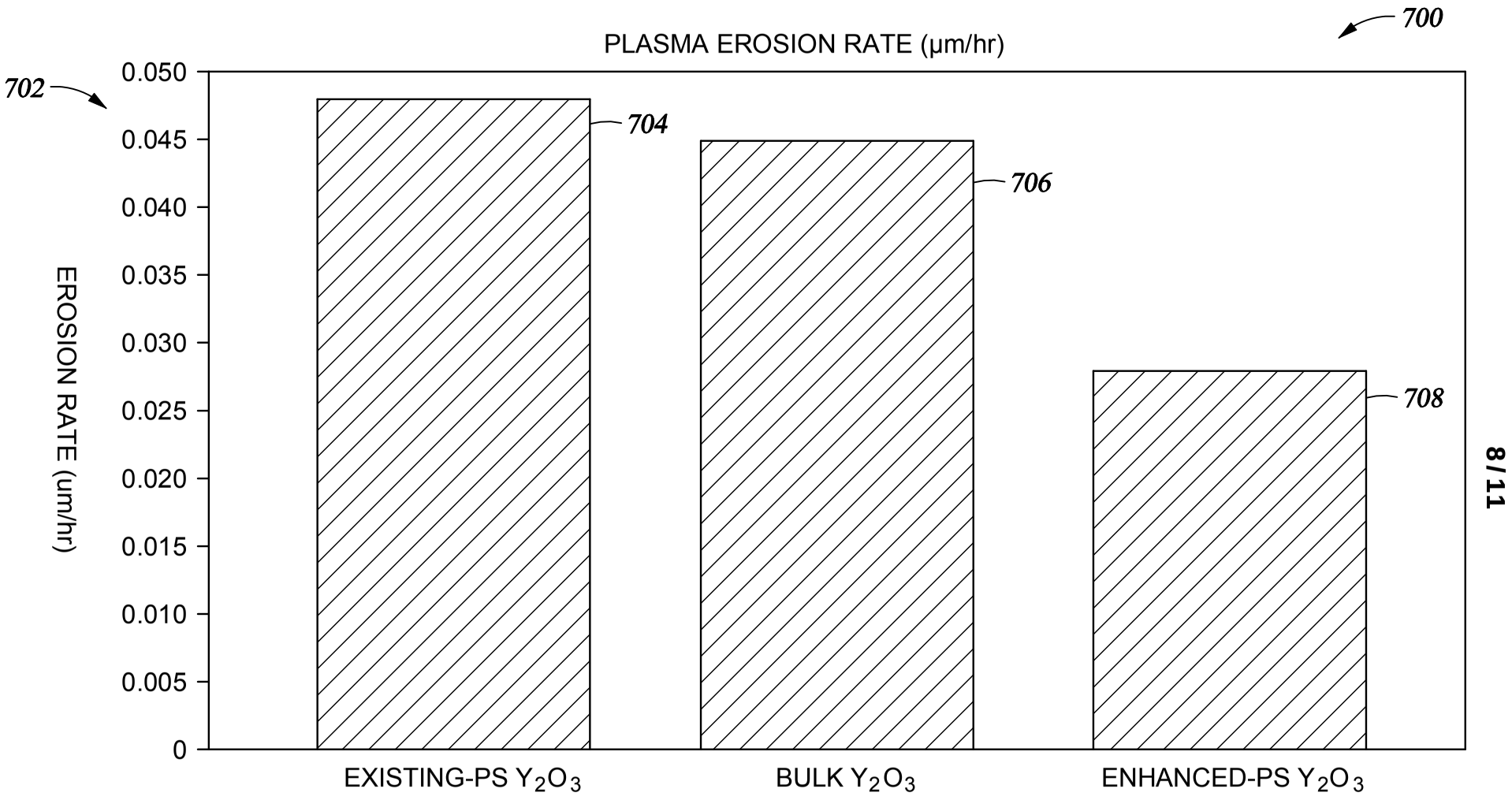

700
PLASMA EROSION RATE (μm/hr)
702
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0
EROSION RATE (um/hr)
704
706
708
EXISTING-PS Y_2O_3
BULK Y_2O_3
ENHANCED-PS Y_2O_3

Fig. 7A

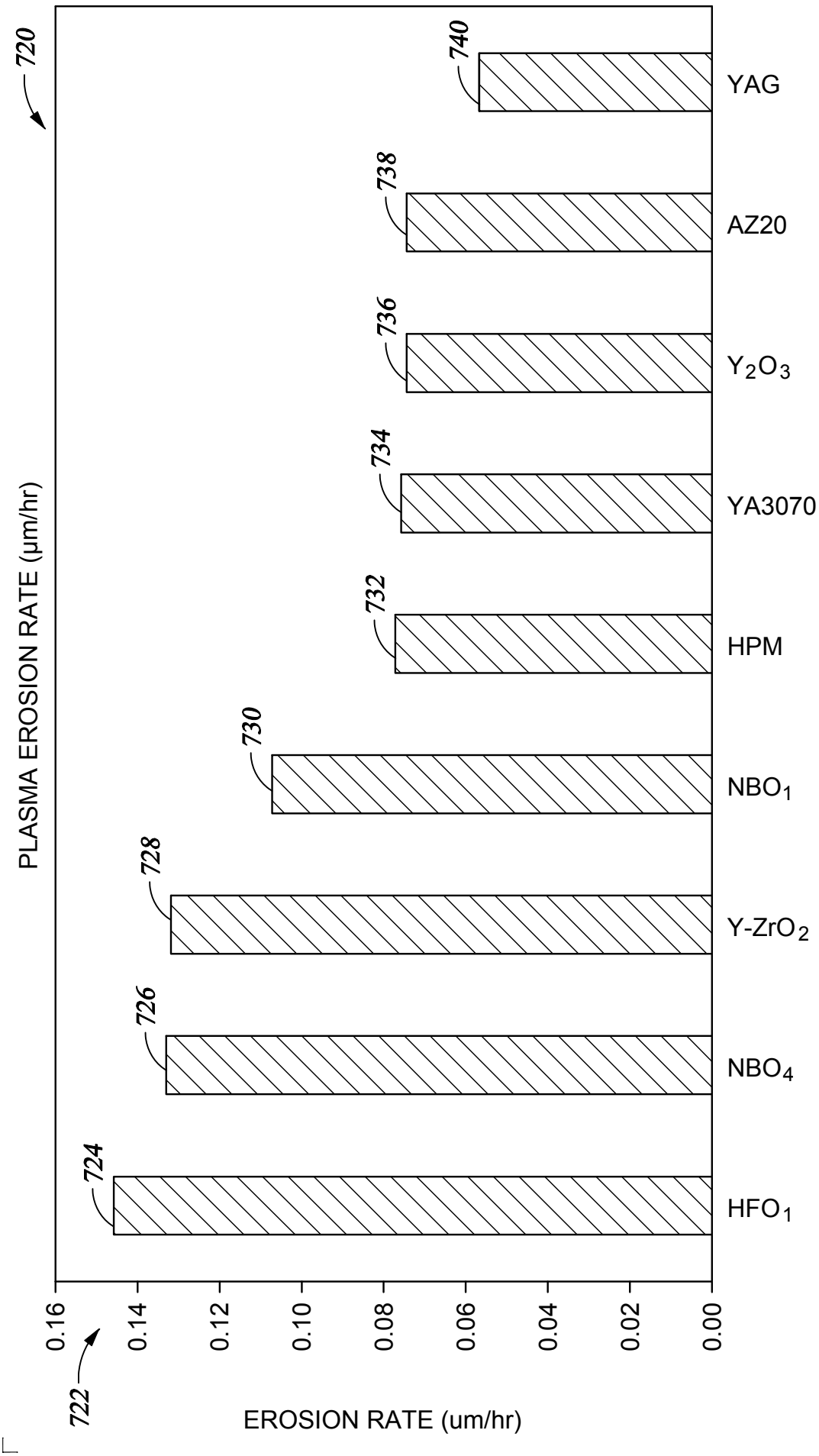

720
PLASMA EROSION RATE (µm/hr)
740
YAG
738
AZ20
736
Y_2O_3
734
YA3070
732
HPM
730
NBO_1
728
Y-ZrO_2
726
NBO_4
724
HFO_1
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
722
EROSION RATE (um/hr)

Fig. 7B

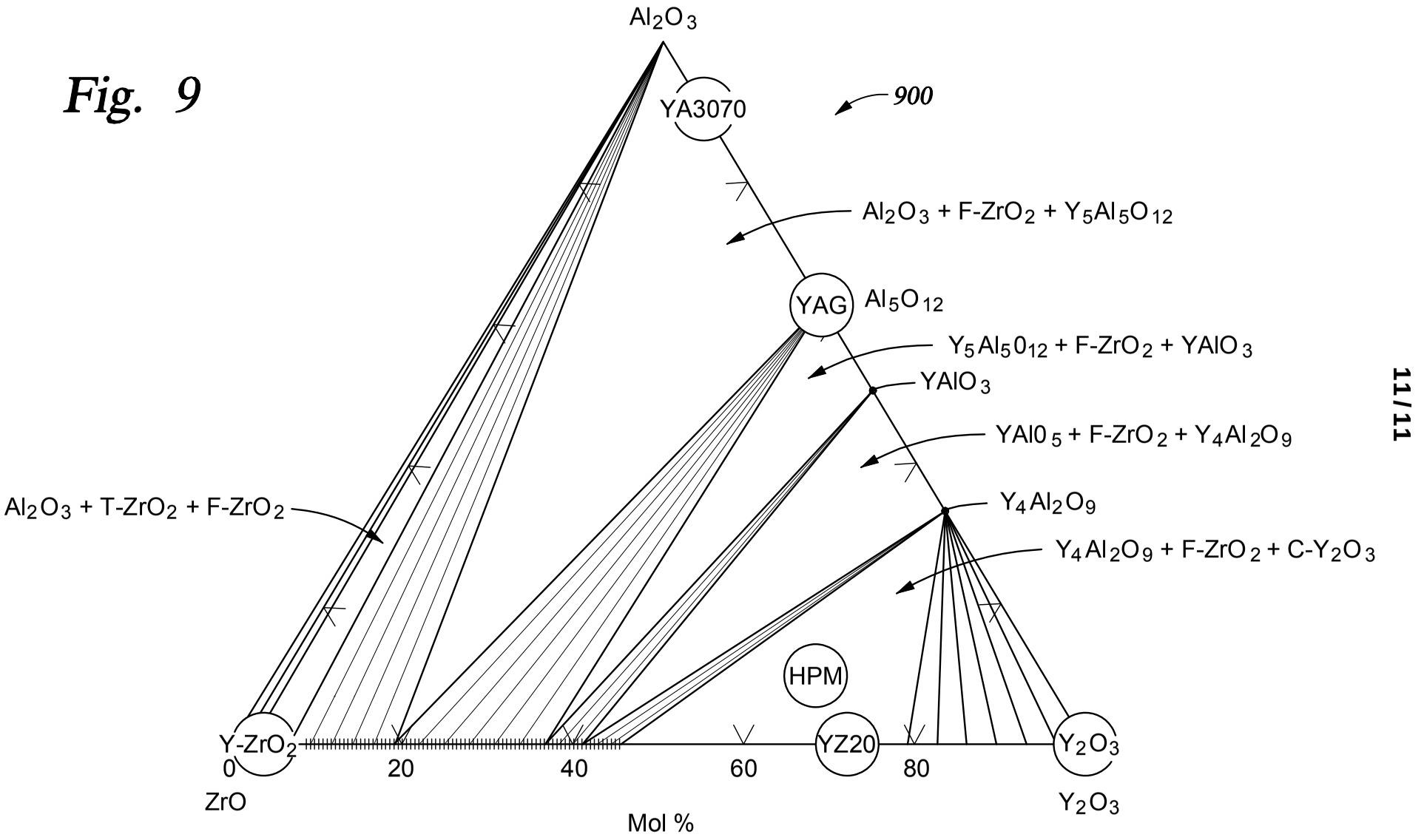
800

EROSION RATE AND CHEMICAL COMPOSITION OF DIFFERENT MATERIALS

NEW NAME	EROSION RATE (um/hr)	COMPOSITION
YAG	0.057	37.5mol% Y_2O_3 62.5mol% Al_2O_3
YZ20	0.074	73.2mol% Y_2O_3 26.8mol% ZrO_2
Y2O3	0.074	100mol% Y_2O_3
YA3070	0.076	8.5mol% Y_2O_3 91.5mol% Al_2O_3
HPM	0.077	63mol%Y_2O_3, 14mol% Al_2O_3, 23mol% ZrO_2
NBO1	0.107	70mol%Y_2O_3, 10mol% Nb_2O_5, 20mol% ZrO_2
Y-ZrO2	0.132	3mol% Y_2O_3, 97mol% ZrO_2
NBO4	0.133	60mol%Y_2O_3, 20mol% Nb_2O_5, 20mol% ZrO_2
HFO1	0.146	75mol%Y_2O_3, 20mol% HfO_2, and 5mol%ZrO_2

Fig. 8

Fig. 9


Al_2O_3
YA3070
900
$Al_2O_3 + F\text{-}ZrO_2 + Y_5Al_5O_{12}$
YAG
Al_5O_{12}
$Y_5Al_50_{12} + F\text{-}ZrO_2 + YAlO_3$
$YAlO_3$
$YAl0_5 + F\text{-}ZrO_2 + Y_4Al_2O_9$
$Al_2O_3 + T\text{-}ZrO_2 + F\text{-}ZrO_2$
$Y_4Al_2O_9$
$Y_4Al_2O_9 + F\text{-}ZrO_2 + C\text{-}Y_2O_3$
HPM
$Y\text{-}ZrO_2$
YZ20
Y_2O_3
0
20
40
60
80
ZrO
Y_2O_3
Mol %