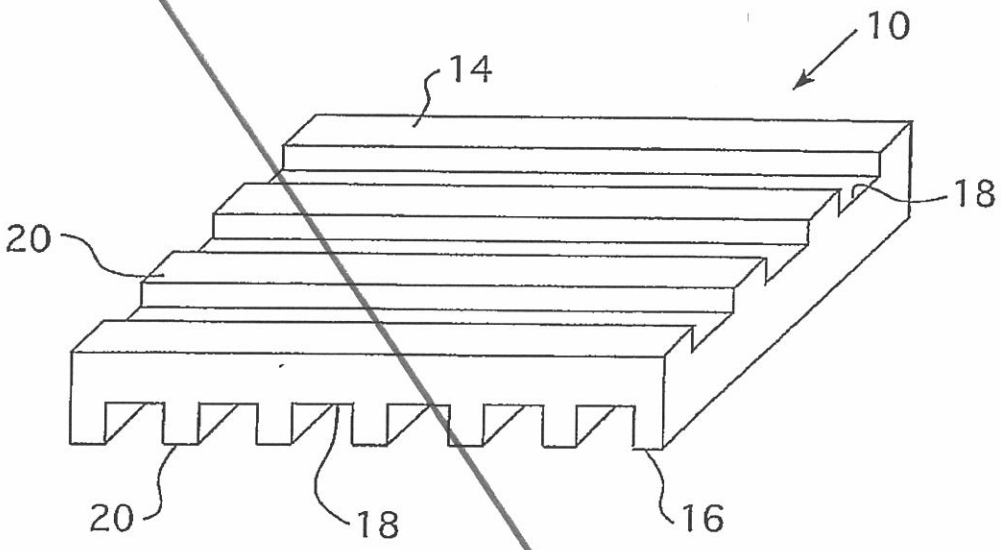


FIG. 1

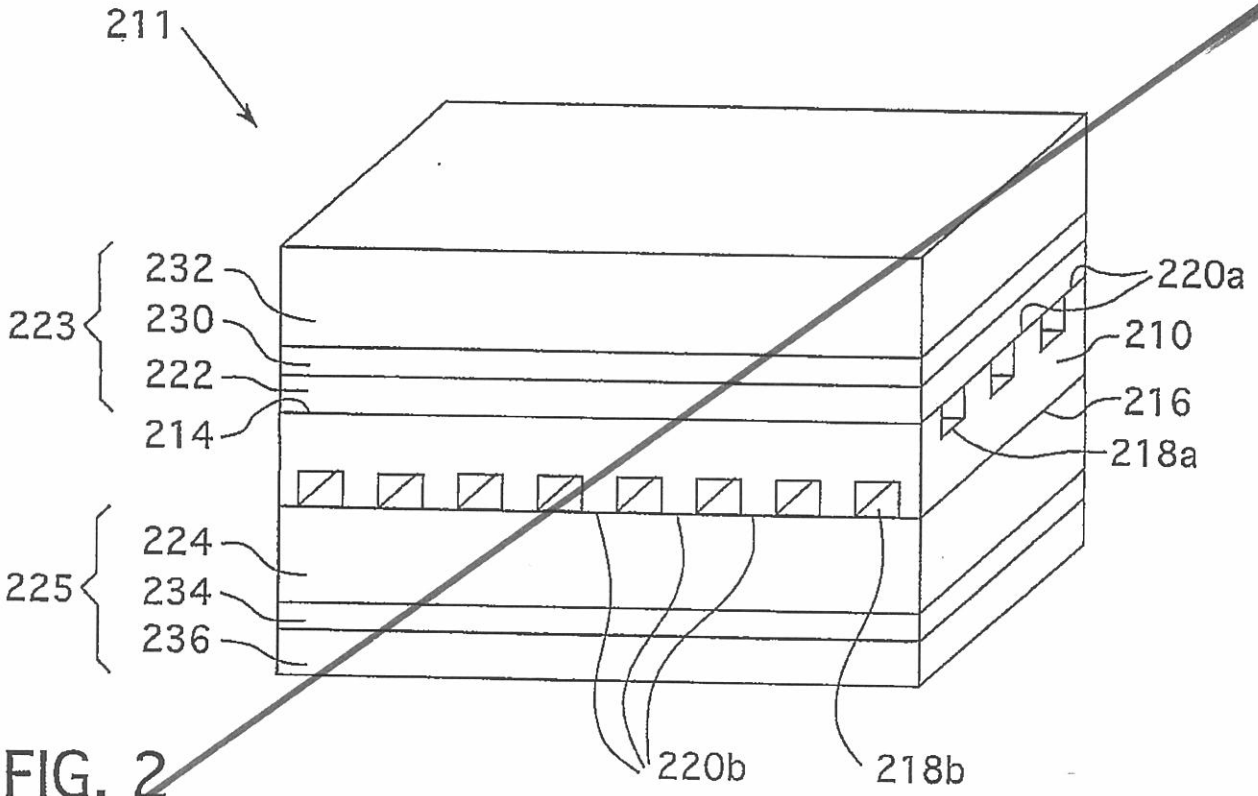

211
223
232
230
222
214
225
224
234
236
220a
210
216
218a
220b
218b

FIG. 2

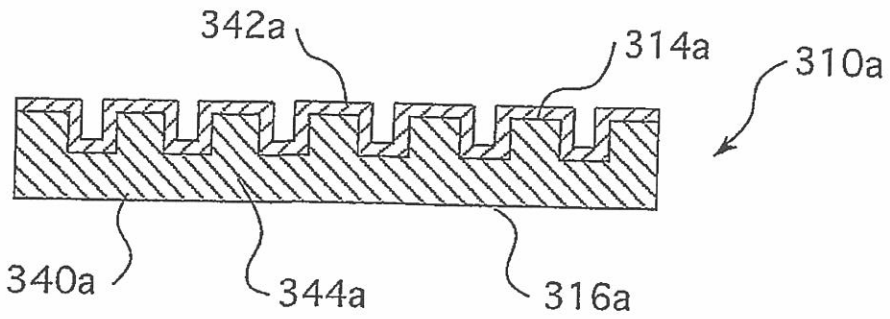


FIG. 3a

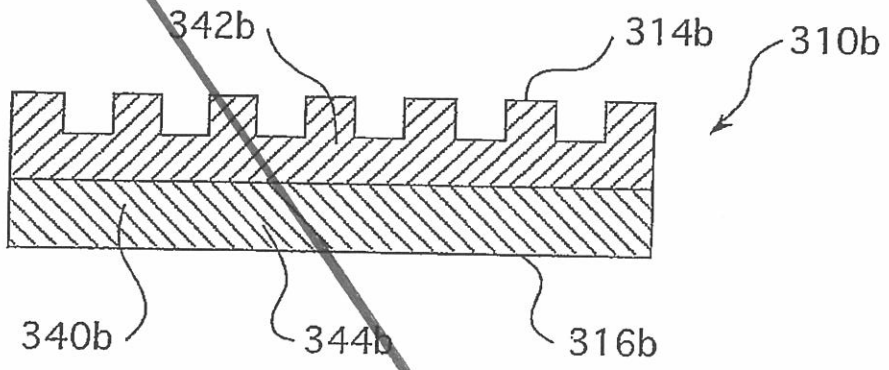


FIG. 3b

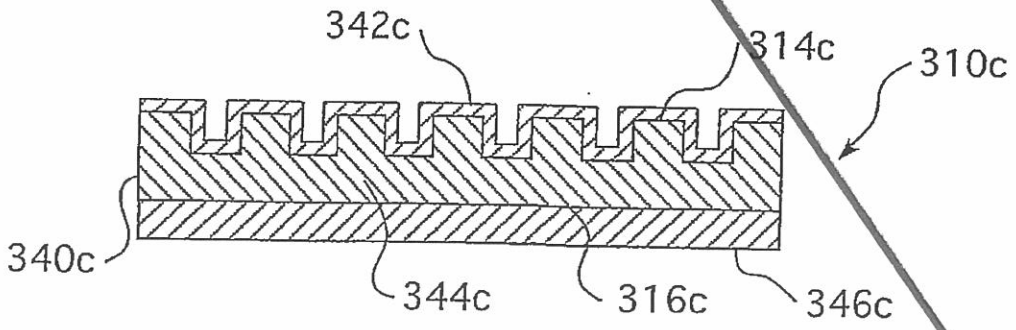


FIG. 3c

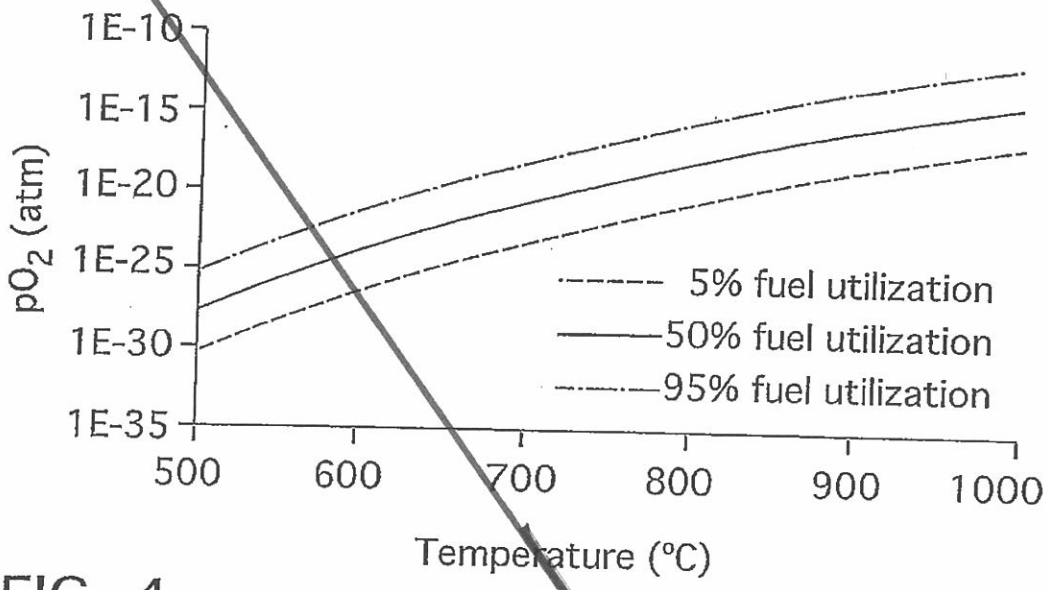

1E-10
1E-15
1E-20
1E-25
1E-30
1E-35
pO_2 (atm)
500
600
700
800
900
1000
Temperature (°C)
5% fuel utilization
50% fuel utilization
95% fuel utilization

FIG. 4

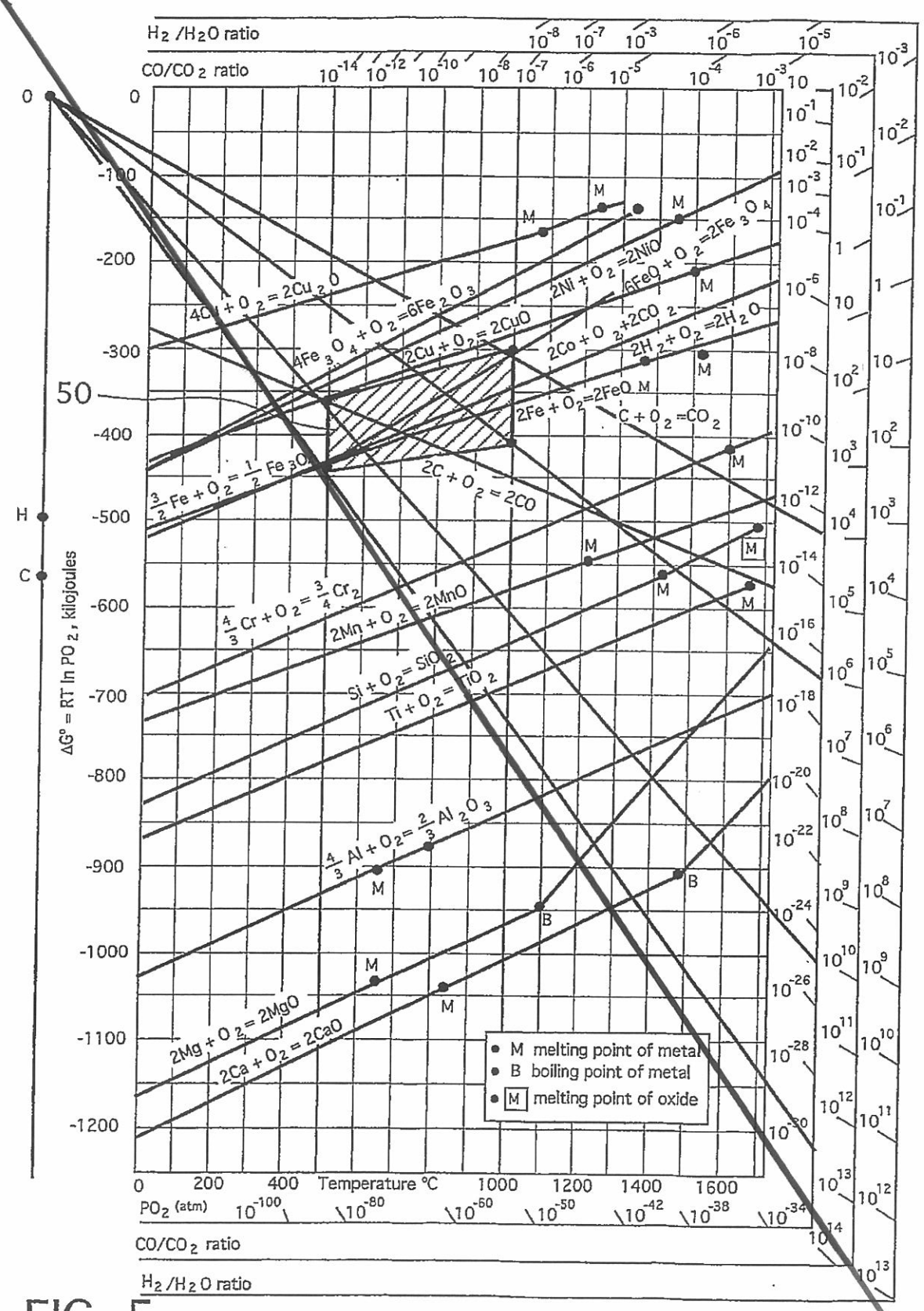

H2 /H2O ratio
CO/CO2 ratio
ΔG° = RT ln PO2, kilojoules
Temperature °C
PO2 (atm)
CO/CO2 ratio
H2 /H2O ratio
2Cu + O2 = 2Cu2O
4Fe3O4 + O2 = 6Fe2O3
2Cu + O2 = 2CuO
2Ni + O2 = 2NiO
6FeO + O2 = 2Fe3O4
2Co + O2 = 2CoO
2H2 + O2 = 2H2O
2Fe + O2 = 2FeO
C + O2 = CO2
3/2 Fe + O2 = 1/2 Fe3O4
2C + O2 = 2CO
4/3 Cr + O2 = 2/3 Cr2O3
2Mn + O2 = 2MnO
Si + O2 = SiO2
Ti + O2 = TiO2
4/3 Al + O2 = 2/3 Al2O3
2Mg + O2 = 2MgO
2Ca + O2 = 2CaO
M melting point of metal
B boiling point of metal
M melting point of oxide
50
H
C

FIG. 5

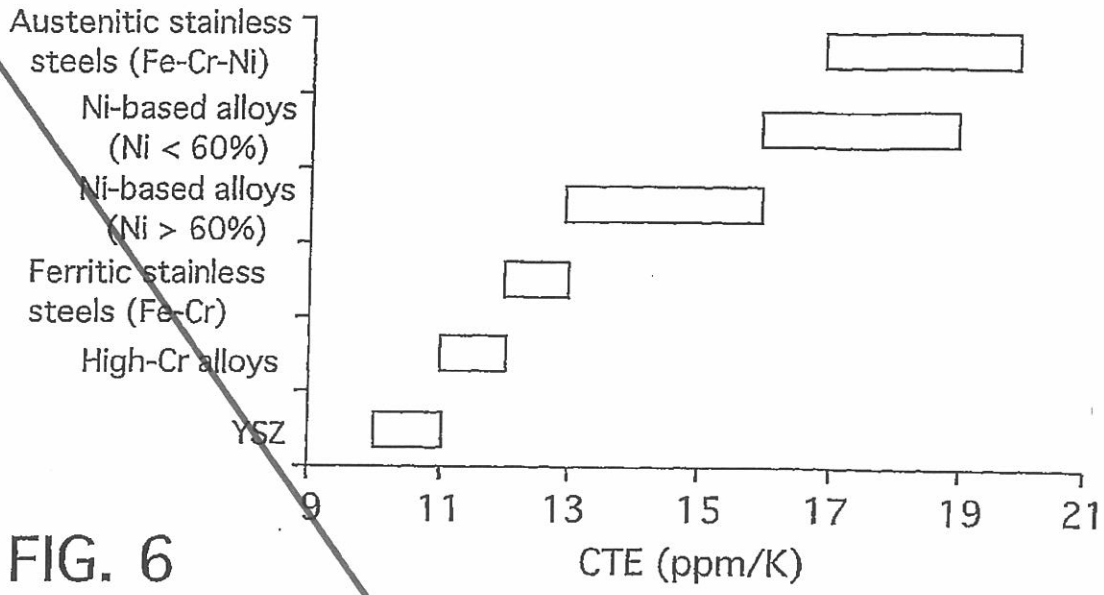

Austenitic stainless steels (Fe-Cr-Ni)
Ni-based alloys (Ni < 60%)
Ni-based alloys (Ni > 60%)
Ferritic stainless steels (Fe-Cr)
High-Cr alloys
YSZ
9
11
13
15
17
19
21
CTE (ppm/K)

FIG. 6

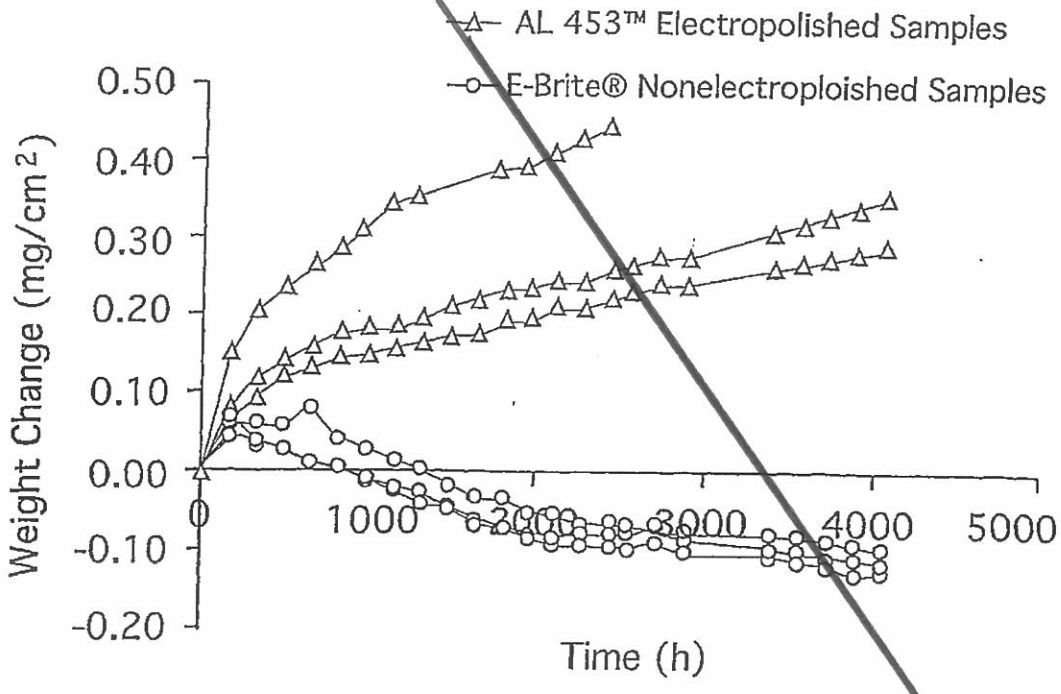

AL 453™ Electropolished Samples
E-Brite® Nonelectroploished Samples
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
Weight Change (mg/cm²)
0
1000
2000
3000
4000
5000
Time (h)

FIG. 7

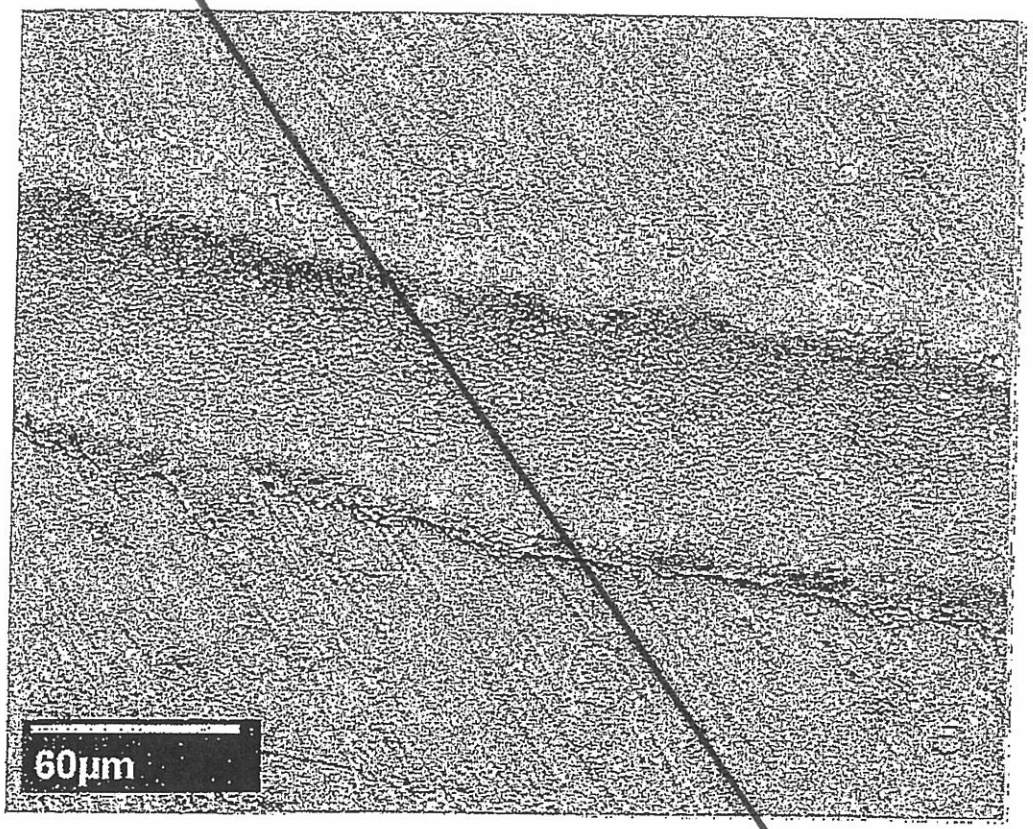


FIG. 8a

FIG. 8b

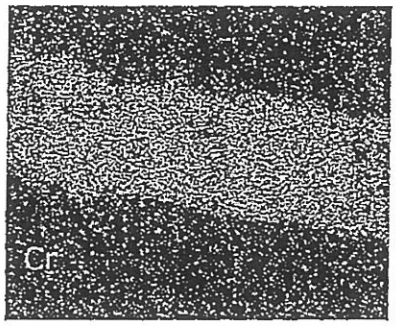


FIG. 8c

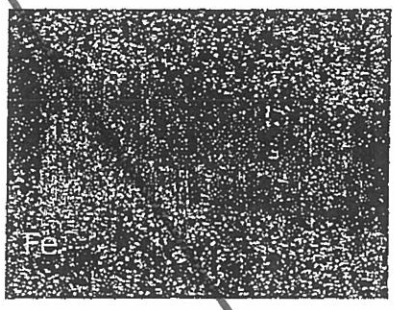


FIG. 8d

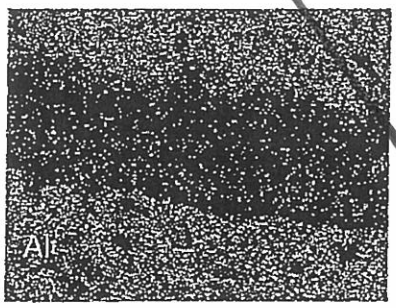
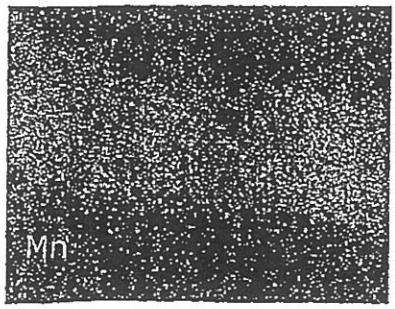


FIG. 8e



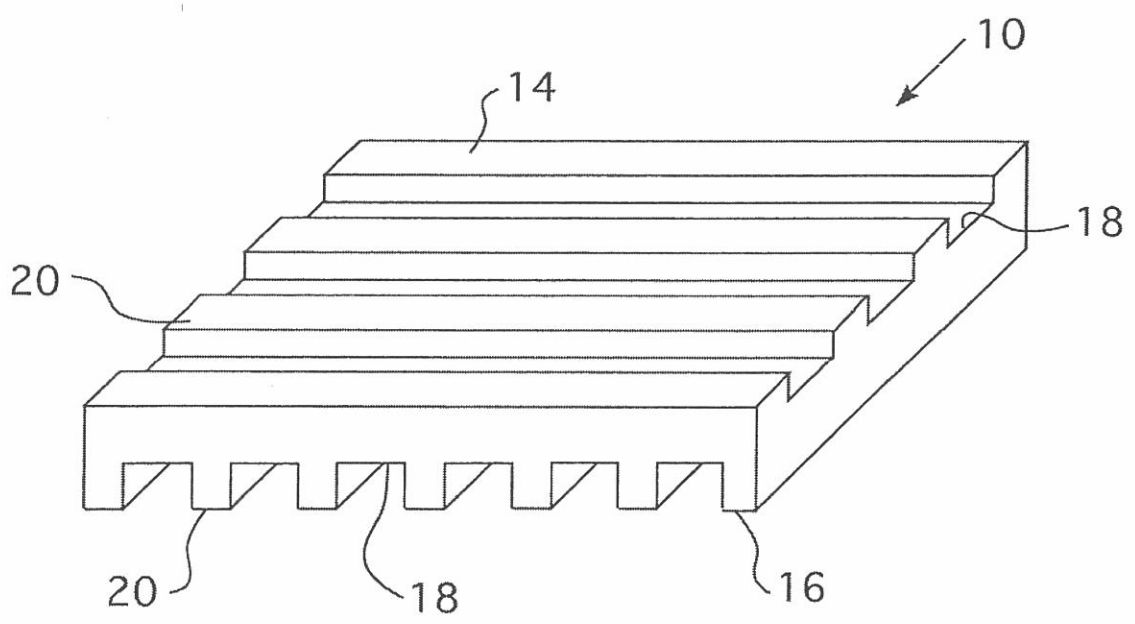


FIG. 1

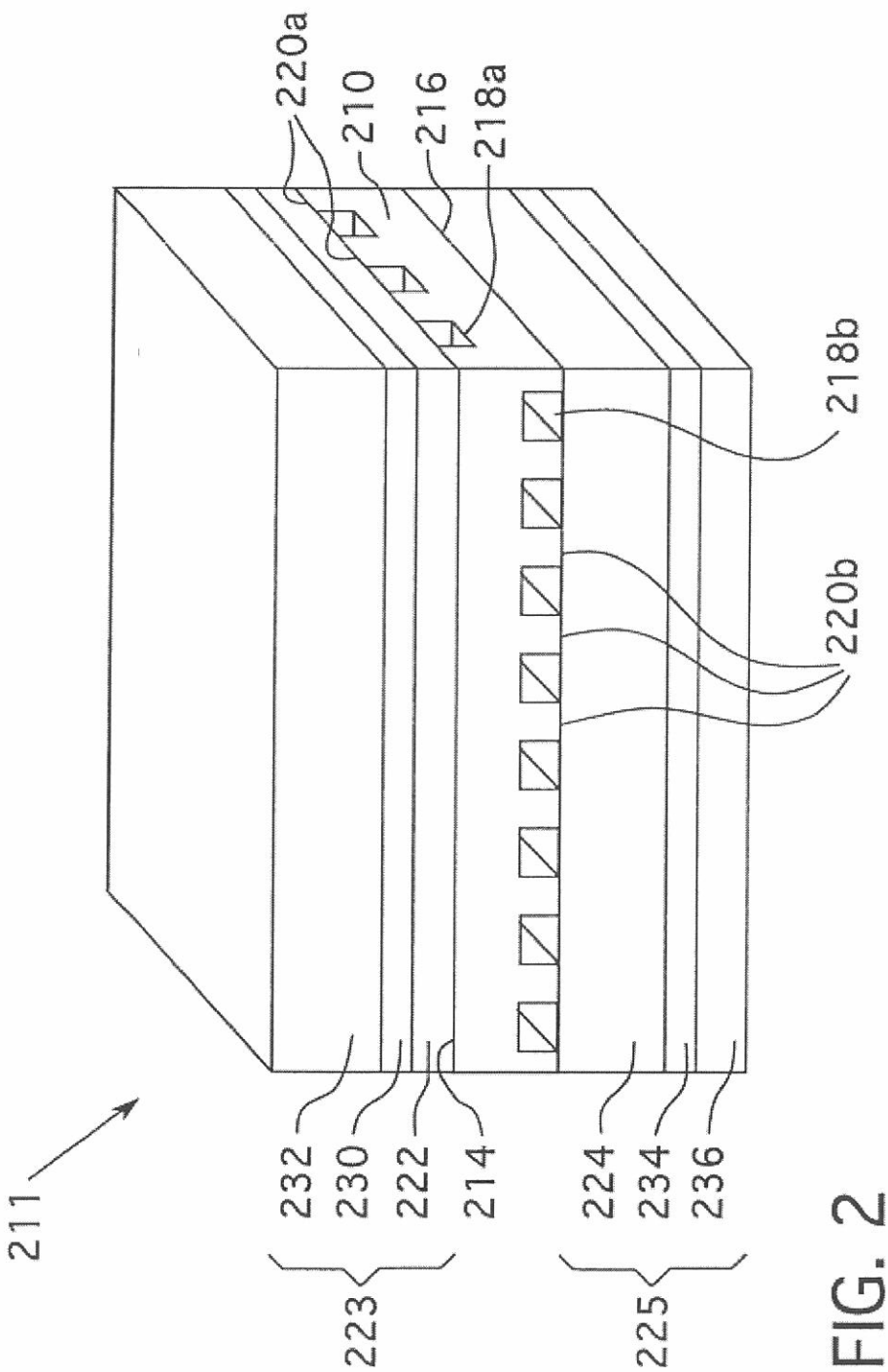

220a
210
216
218a
218b
220b
211
232
230
222
214
224
234
236
223
225

FIG. 2

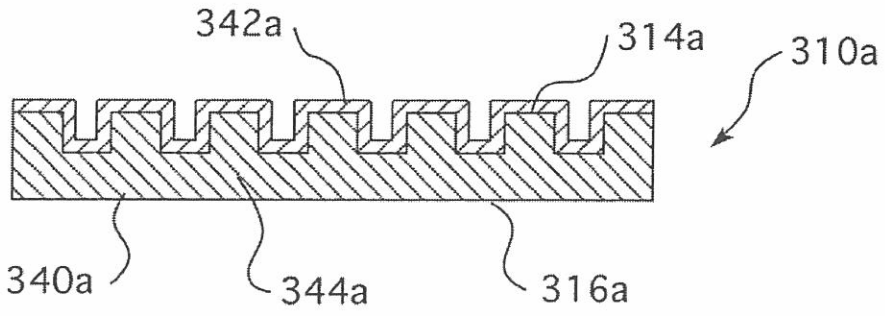


FIG. 3a

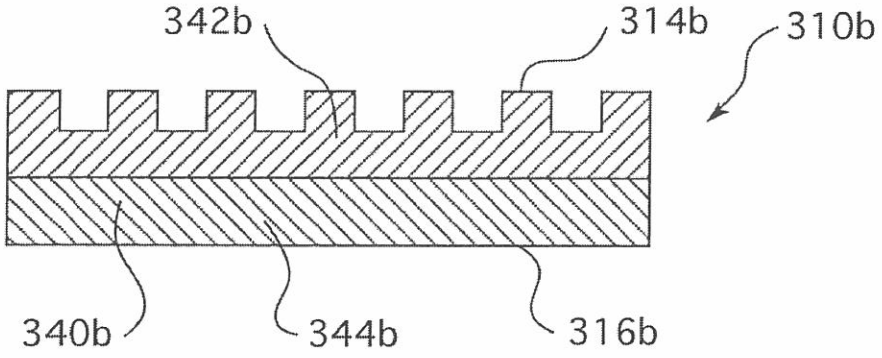


FIG. 3b

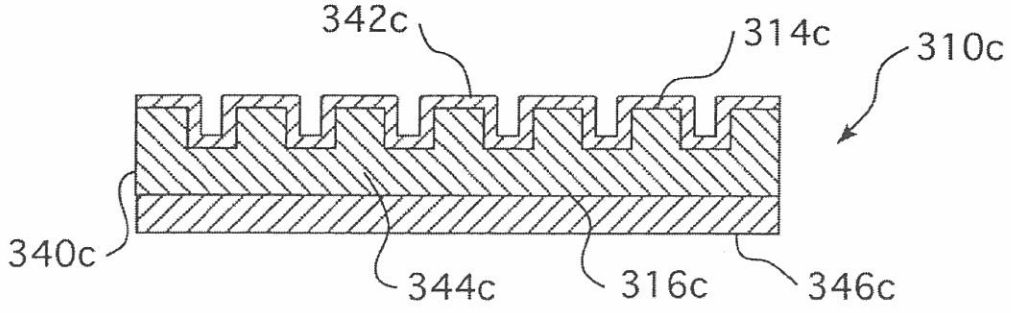


FIG. 3c

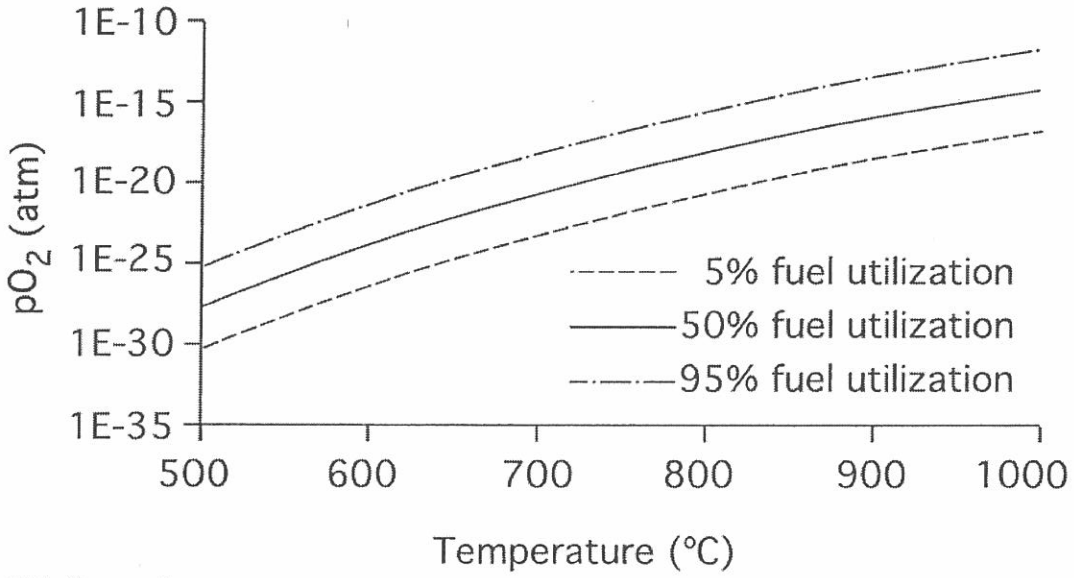

1E-10
1E-15
1E-20
1E-25
1E-30
1E-35
pO_2 (atm)
500
600
700
800
900
1000
Temperature (°C)
5% fuel utilization
50% fuel utilization
95% fuel utilization

FIG. 4

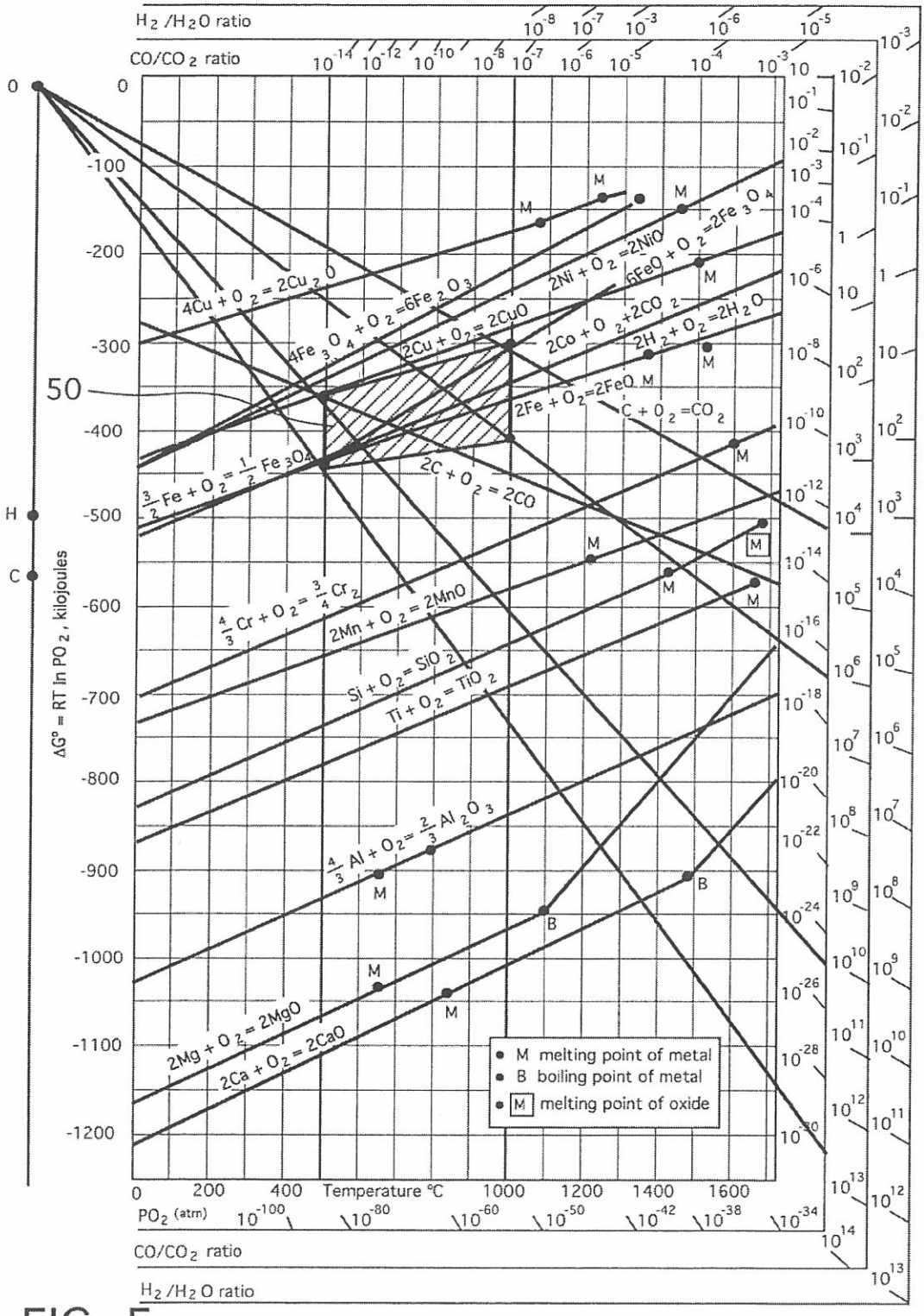

H2 /H2O ratio
CO/CO2 ratio
ΔG° = RT ln PO2, kilojoules
Temperature °C
PO2 (atm)
4Cu + O2 = 2Cu2O
4Fe3O4 + O2 = 6Fe2O3
2Cu + O2 = 2CuO
2Ni + O2 = 2NiO
6FeO + O2 = 2Fe3O4
2Co + O2 = 2CoO
2H2 + O2 = 2H2O
2Fe + O2 = 2FeO
C + O2 = CO2
3/2 Fe + O2 = 1/2 Fe3O4
2C + O2 = 2CO
4/3 Cr + O2 = 2/3 Cr2O3
2Mn + O2 = 2MnO
Si + O2 = SiO2
Ti + O2 = TiO2
4/3 Al + O2 = 2/3 Al2O3
2Mg + O2 = 2MgO
2Ca + O2 = 2CaO
M melting point of metal
B boiling point of metal
M melting point of oxide
50
H
C

FIG. 5

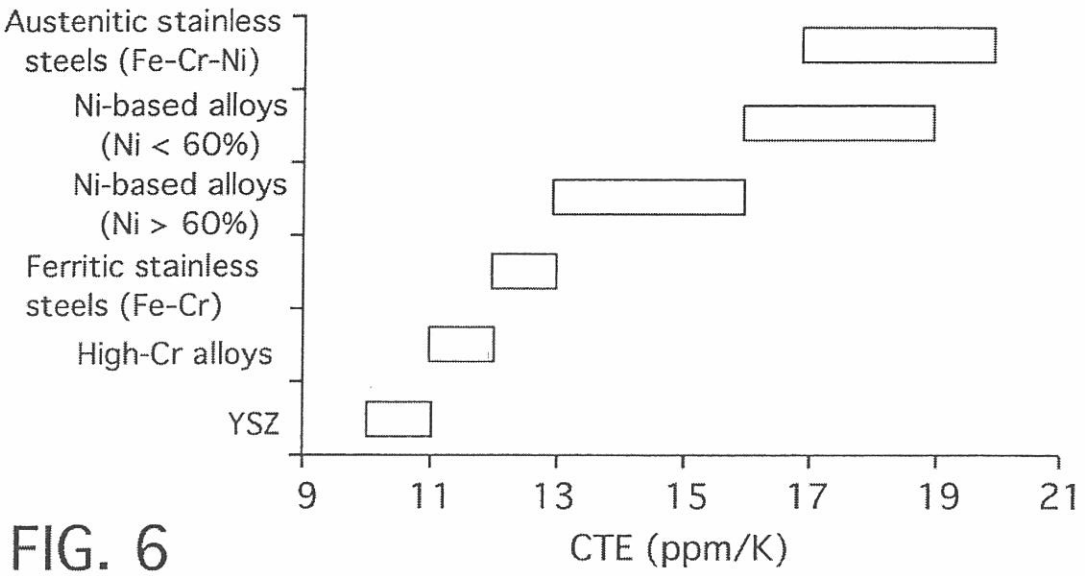

Austenitic stainless steels (Fe-Cr-Ni)
Ni-based alloys (Ni < 60%)
Ni-based alloys (Ni > 60%)
Ferritic stainless steels (Fe-Cr)
High-Cr alloys
YSZ
9
11
13
15
17
19
21
CTE (ppm/K)

FIG. 6

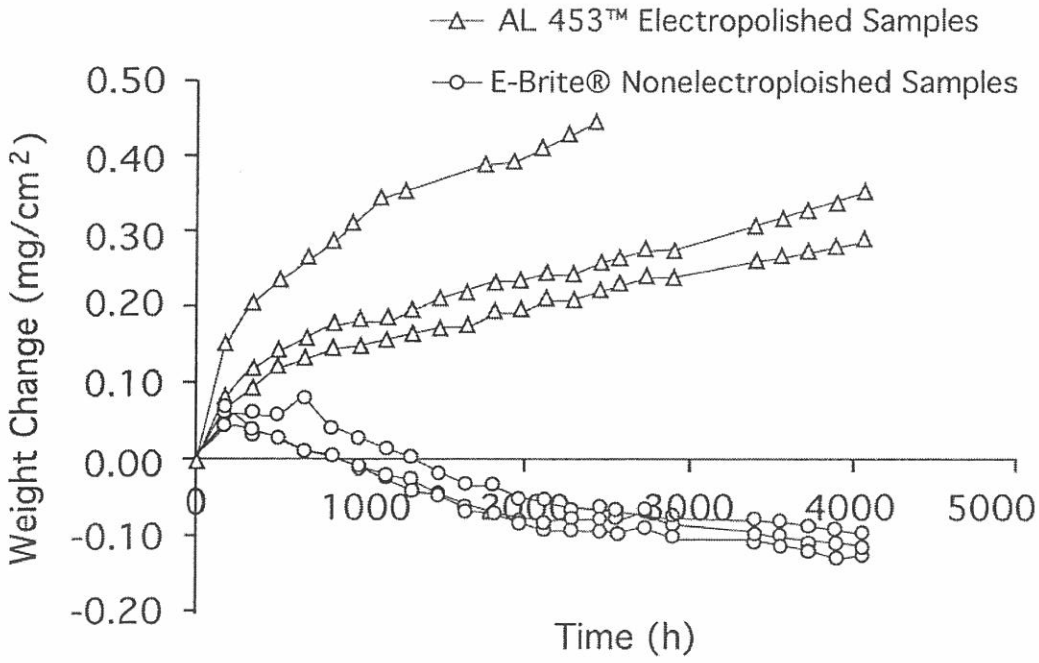

AL 453™ Electropolished Samples
E-Brite® Nonelectroploished Samples
Weight Change (mg/cm²)
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0
1000
2000
3000
4000
5000
Time (h)

FIG. 7

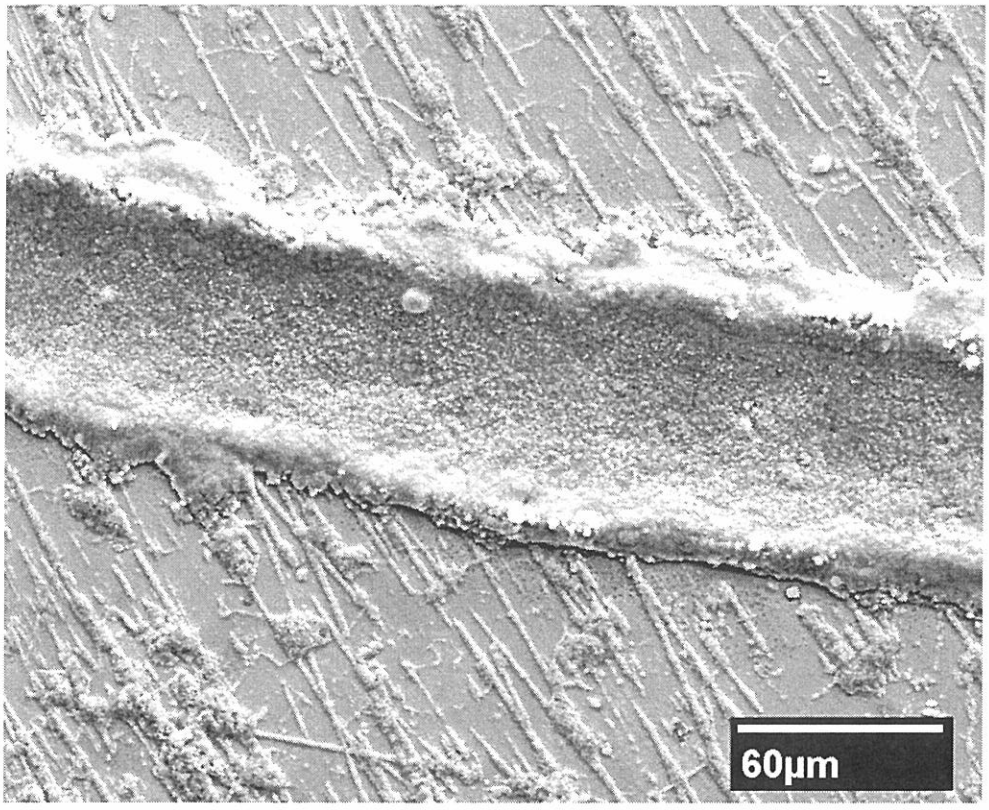


FIG. 8a

FIG. 8b

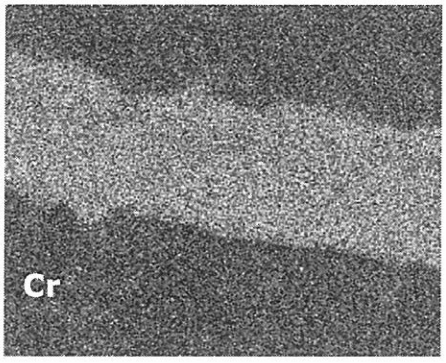


FIG. 8c

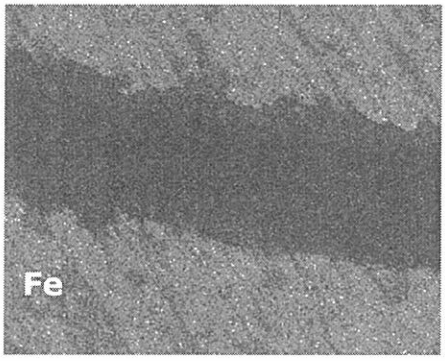


FIG. 8d

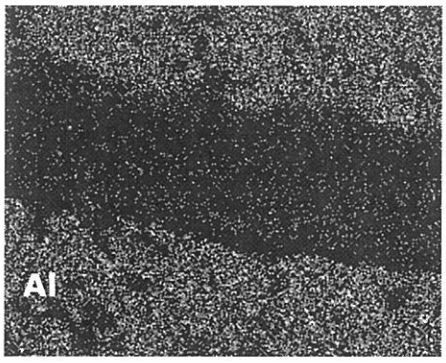


FIG. 8e

