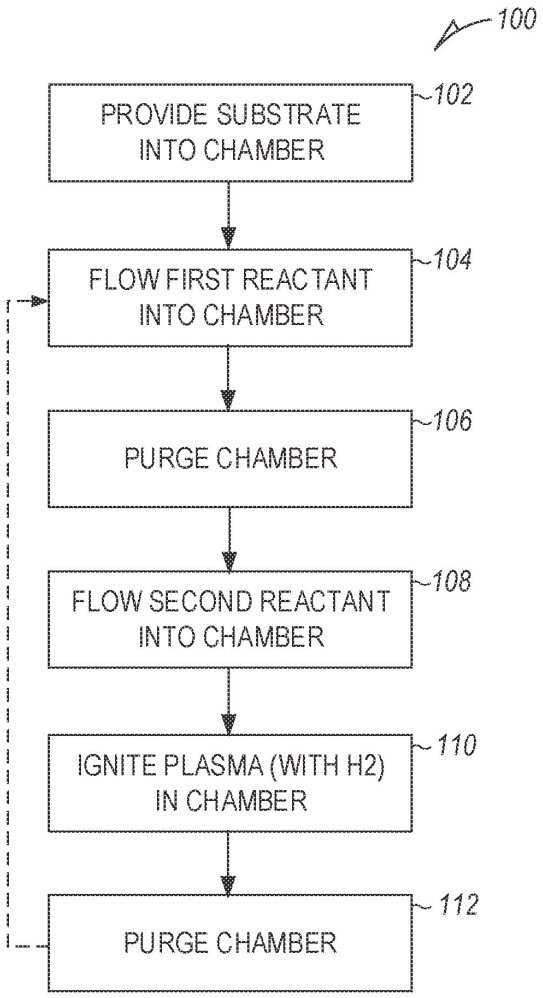
100
PROVIDE SUBSTRATE INTO CHAMBER
102
FLOW FIRST REACTANT INTO CHAMBER
104
PURGE CHAMBER
106
FLOW SECOND REACTANT INTO CHAMBER
108
IGNITE PLASMA (WITH H2) IN CHAMBER
110
PURGE CHAMBER
112

FIG. 1

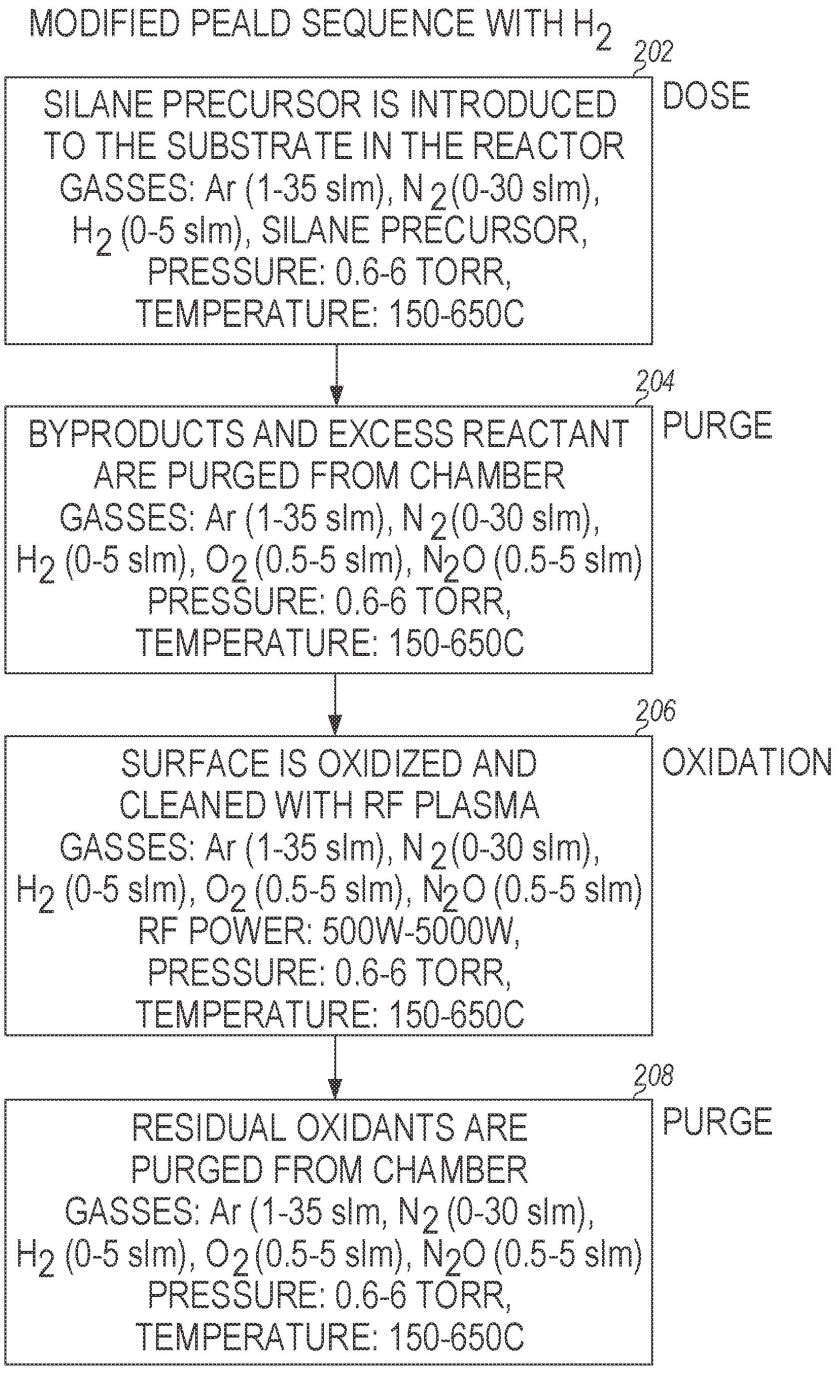
MODIFIED PEALD SEQUENCE WITH H_2
202
SILANE PRECURSOR IS INTRODUCED TO THE SUBSTRATE IN THE REACTOR
GASSES: Ar (1-35 slm), N_2 (0-30 slm), H_2 (0-5 slm), SILANE PRECURSOR,
PRESSURE: 0.6-6 TORR,
TEMPERATURE: 150-650C
DOSE
204
BYPRODUCTS AND EXCESS REACTANT ARE PURGED FROM CHAMBER
GASSES: Ar (1-35 slm), N_2 (0-30 slm), H_2 (0-5 slm), O_2 (0.5-5 slm), N_2O (0.5-5 slm)
PRESSURE: 0.6-6 TORR,
TEMPERATURE: 150-650C
PURGE
206
SURFACE IS OXIDIZED AND CLEANED WITH RF PLASMA
GASSES: Ar (1-35 slm), N_2 (0-30 slm), H_2 (0-5 slm), O_2 (0.5-5 slm), N_2O (0.5-5 slm)
RF POWER: 500W-5000W,
PRESSURE: 0.6-6 TORR,
TEMPERATURE: 150-650C
OXIDATION
208
RESIDUAL OXIDANTS ARE PURGED FROM CHAMBER
GASSES: Ar (1-35 slm, N_2 (0-30 slm), H_2 (0-5 slm), O_2 (0.5-5 slm), N_2O (0.5-5 slm)
PRESSURE: 0.6-6 TORR,
TEMPERATURE: 150-650C
PURGE

FIG. 2

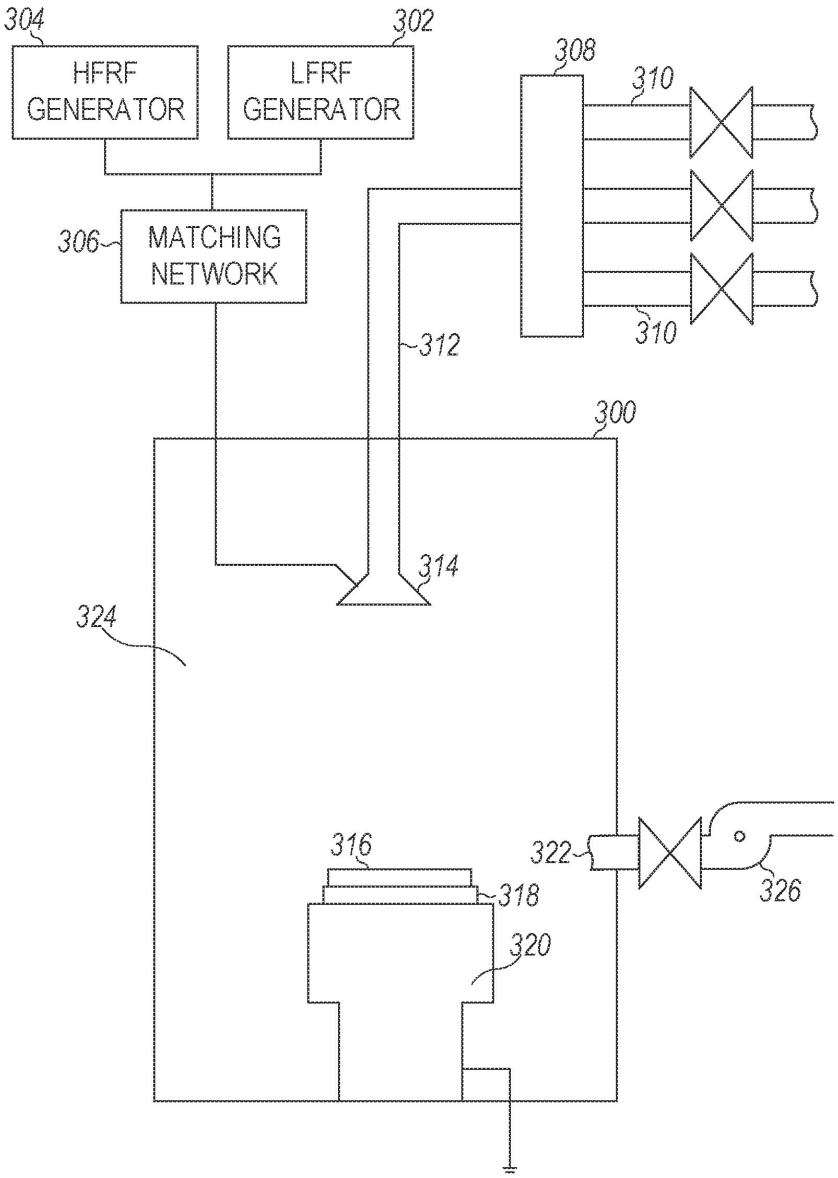
304
HFRF GENERATOR
302
LFRF GENERATOR
308
310
306
MATCHING NETWORK
312
310
300
314
324
316
322
318
326
320

FIG. 3

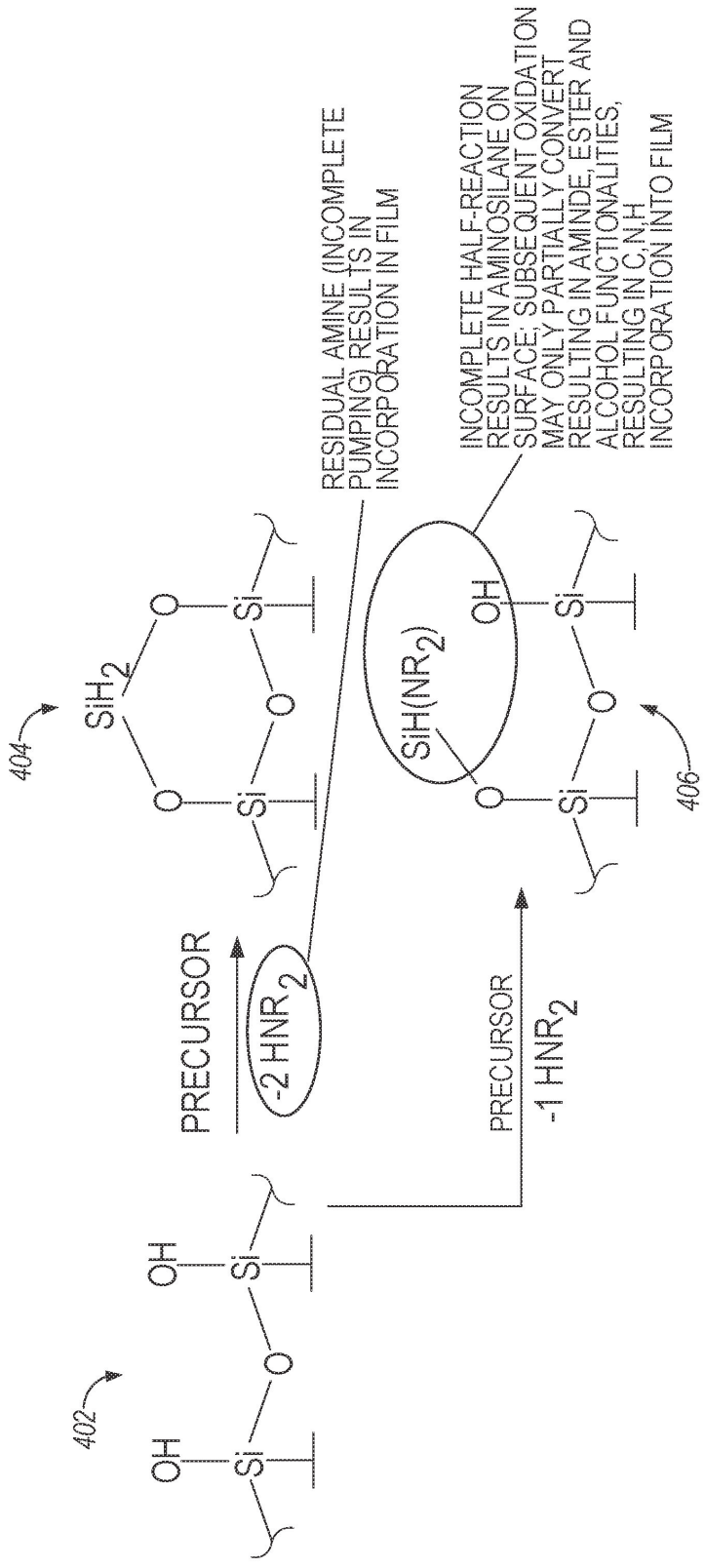
402
OH
Si
O
OH
Si
PRECURSOR
-2 HNR2
RESIDUAL AMINE (INCOMPLETE PUMPING) RESULTS IN INCORPORATION IN FILM
404
SiH2
O
Si
O
O
Si
PRECURSOR
-1 HNR2
INCOMPLETE HALF-REACTION RESULTS IN AMINOSILANE ON SURFACE; SUBSEQUENT OXIDATION MAY ONLY PARTIALLY CONVERT RESULTING IN AMINDE, ESTER AND ALCOHOL FUNCTIONALITIES, RESULTING IN C,N,H INCORPORATION INTO FILM
SiH(NR2)
OH
O
Si
O
Si
406

FIG. 4

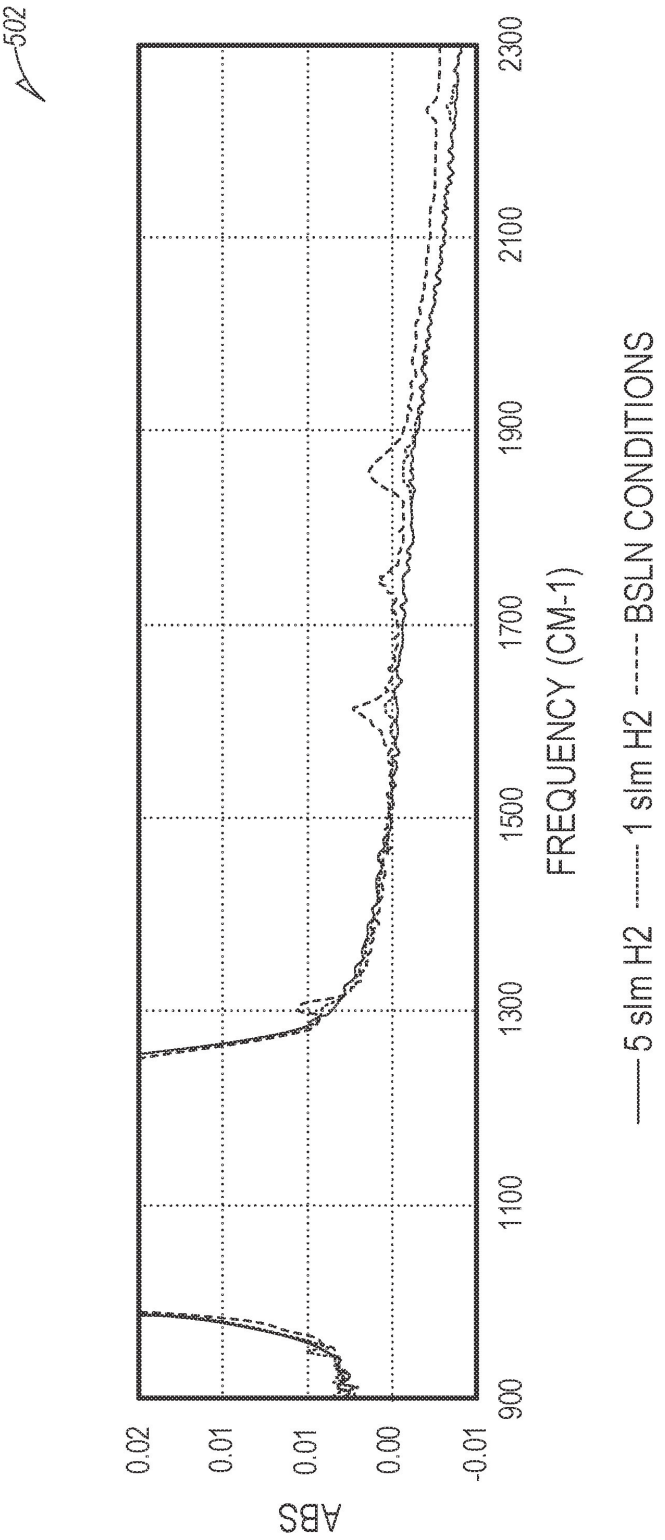
502
ABS
0.02
0.01
0.01
0.00
-0.01
900
1100
1300
1500
1700
1900
2100
2300
FREQUENCY (CM-1)
5 slm H2
1 slm H2
BSLN CONDITIONS

FIG. 5

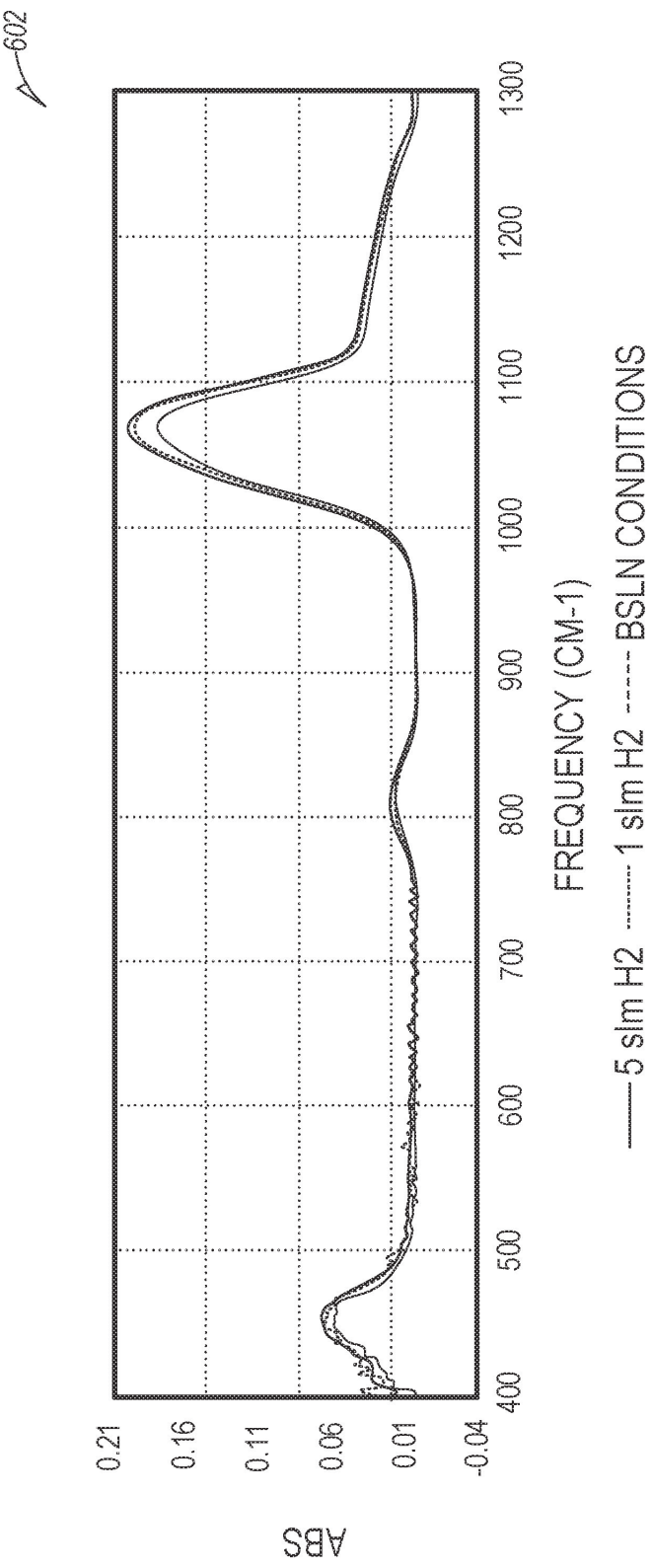
602
ABS
0.21
0.16
0.11
0.06
0.01
-0.04
400
500
600
700
800
900
1000
1100
1200
1300
FREQUENCY (CM-1)
5 slm H2
1 slm H2
BSLN CONDITIONS

FIG. 6