FIG. 1

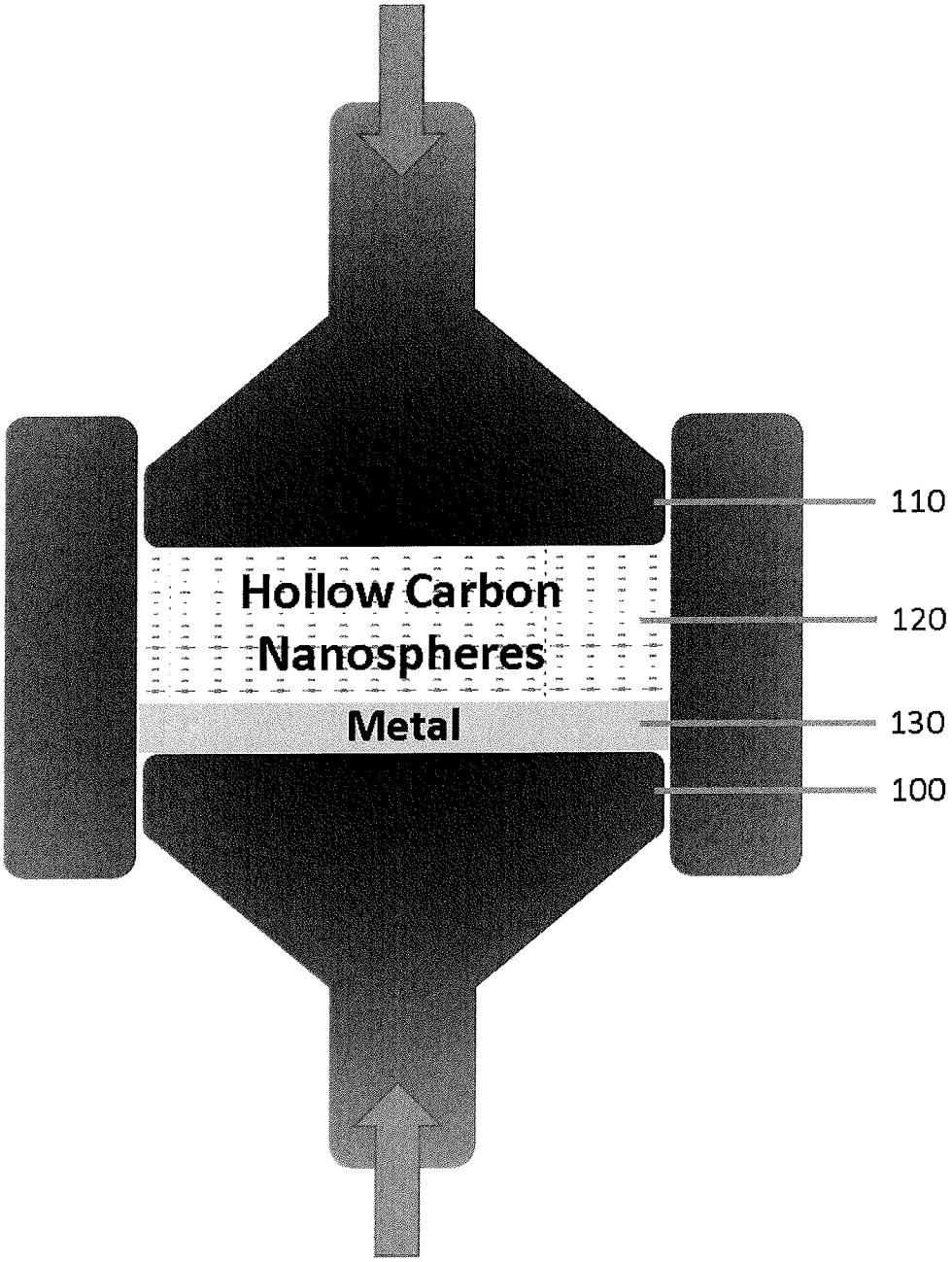
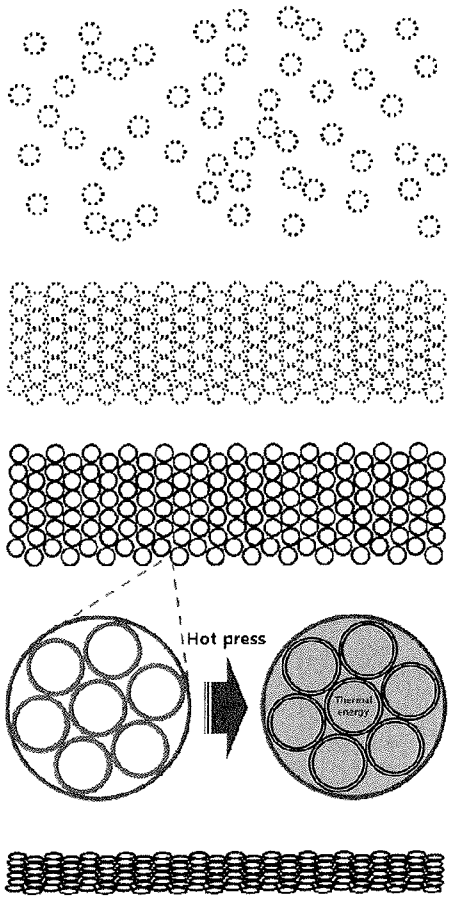


FIG. 2A




Predefined amount of hollow carbon nanoparticles

Closed packed hollow carbon nanoparticles by pressing

Atomic diffusion under high temperature & pressure (Control over amount of micropores)

Densified interconnected 3D Continuous foam (Control over mesopore size)

FIG. 2B

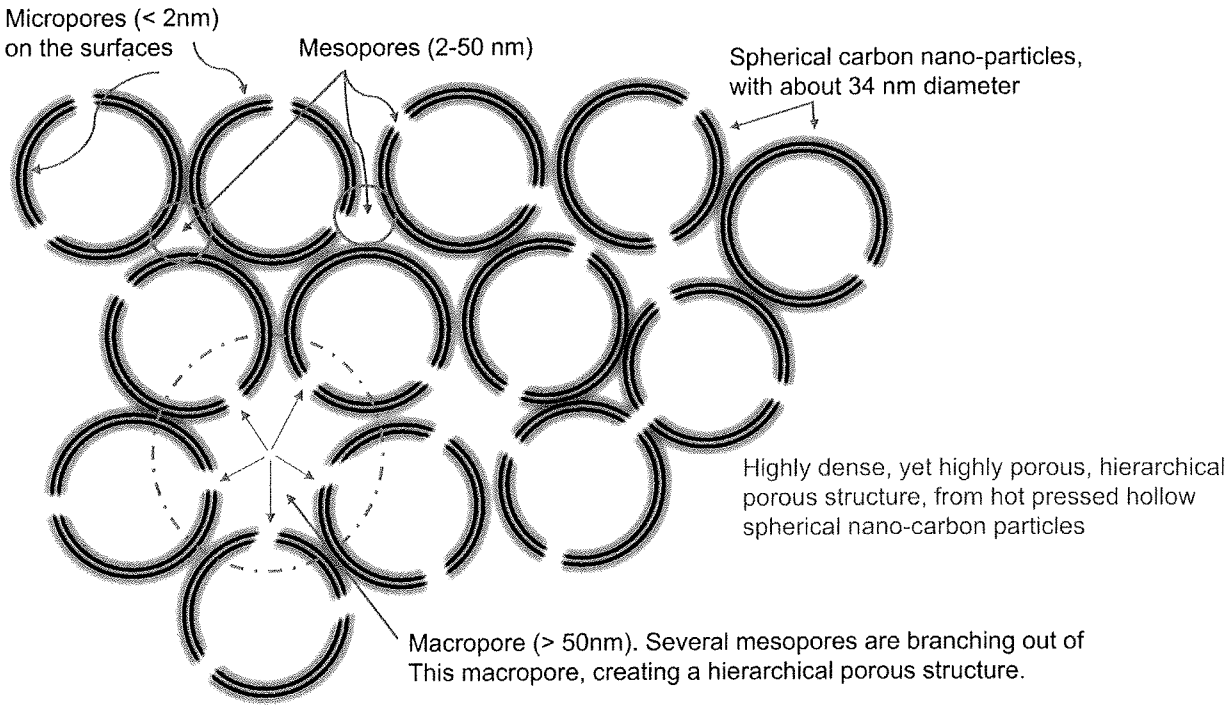

Micropores (< 2nm)
on the surfaces
Mesopores (2-50 nm)
Spherical carbon nano-particles,
with about 34 nm diameter
Highly dense, yet highly porous, hierarchical
porous structure, from hot pressed hollow
spherical nano-carbon particles
Macropore (> 50nm). Several mesopores are branching out of
This macropore, creating a hierarchical porous structure.

FIG. 3A

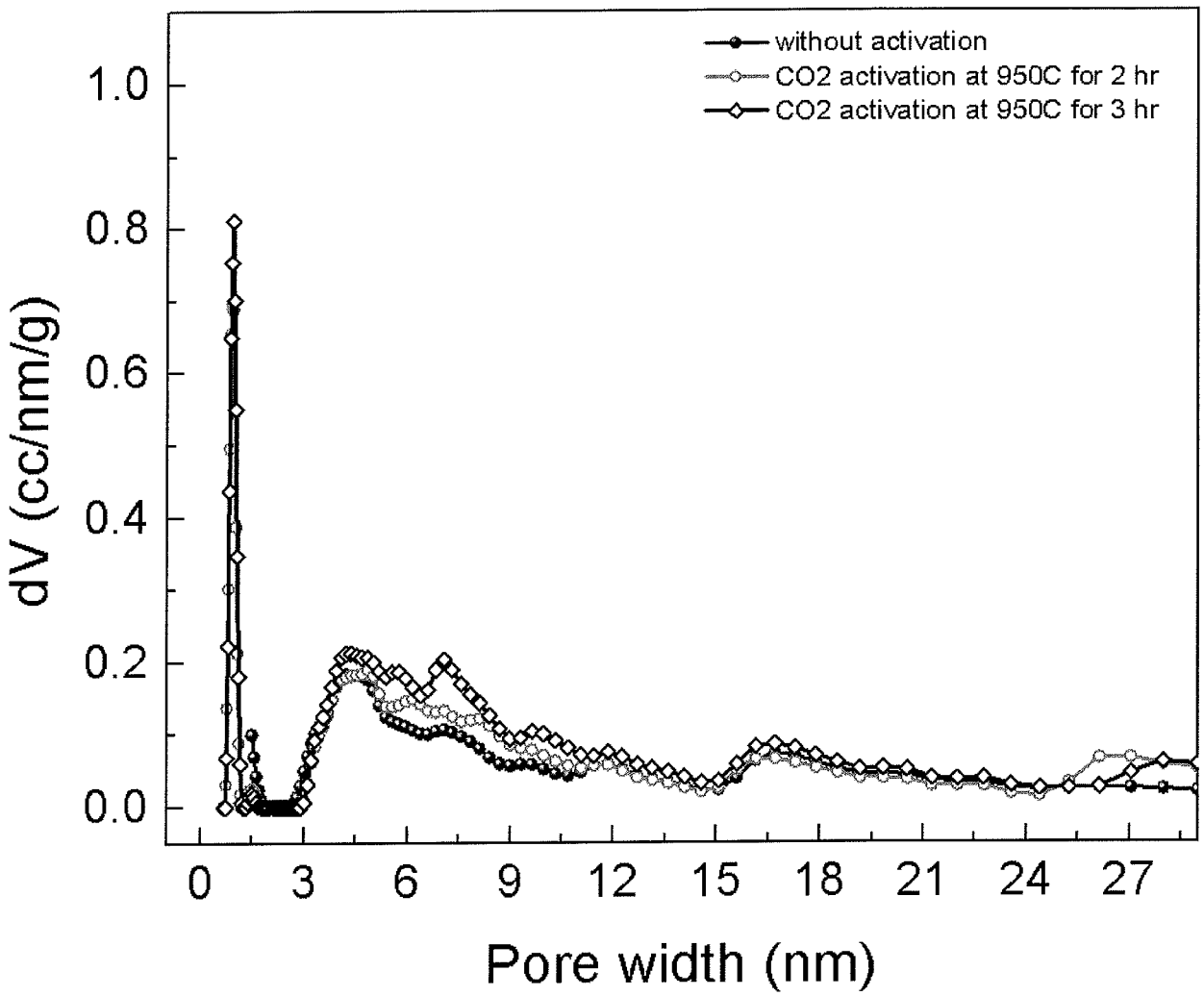

without activation
CO2 activation at 950C for 2 hr
CO2 activation at 950C for 3 hr
dV (cc/nm/g)
1.0
0.8
0.6
0.4
0.2
0.0
0
3
6
9
12
15
18
21
24
27
Pore width (nm)

FIG. 3B

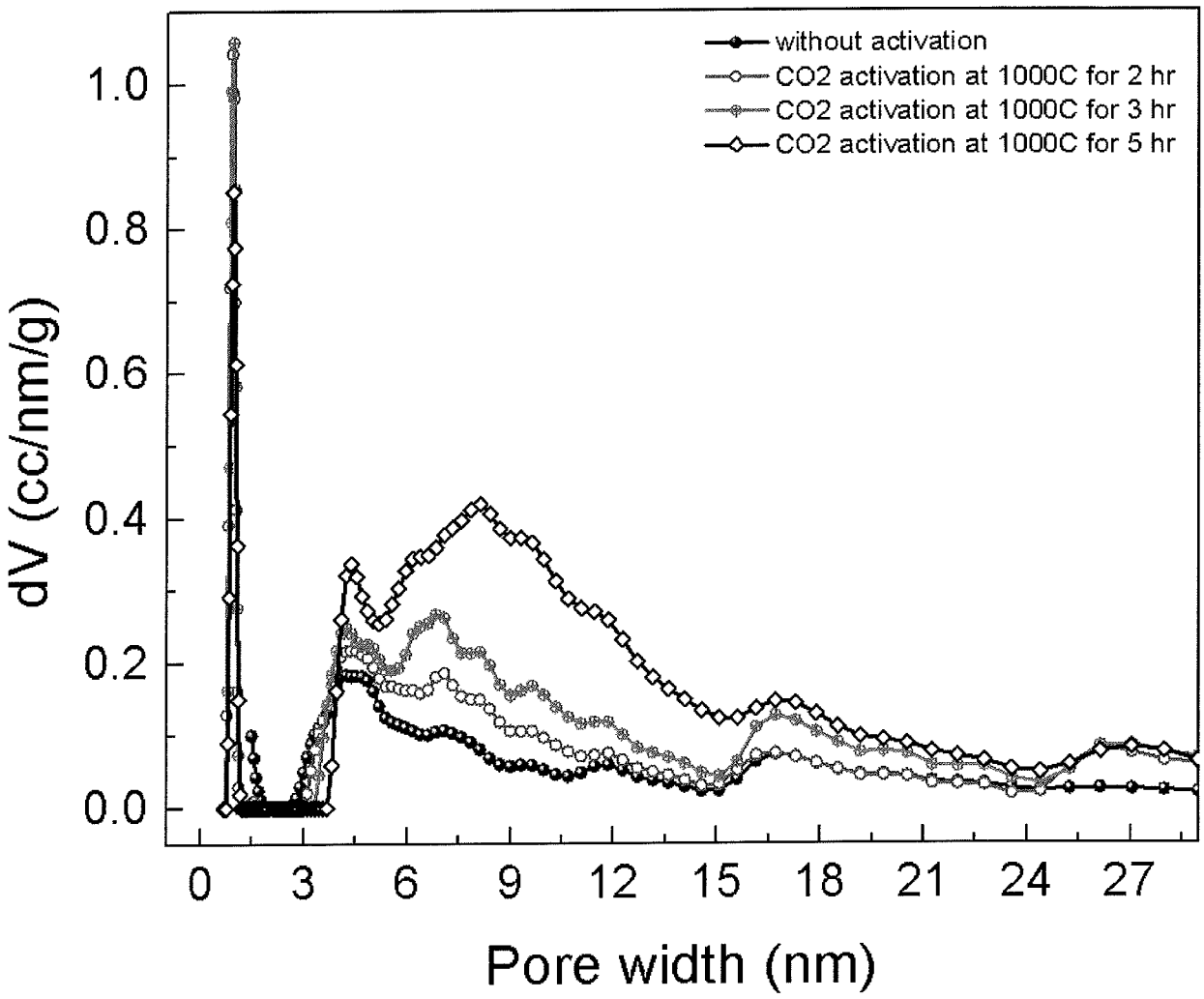

without activation
CO2 activation at 1000C for 2 hr
CO2 activation at 1000C for 3 hr
CO2 activation at 1000C for 5 hr
dV (cc/nm/g)
1.0
0.8
0.6
0.4
0.2
0.0
0
3
6
9
12
15
18
21
24
27
Pore width (nm)

FIG. 4

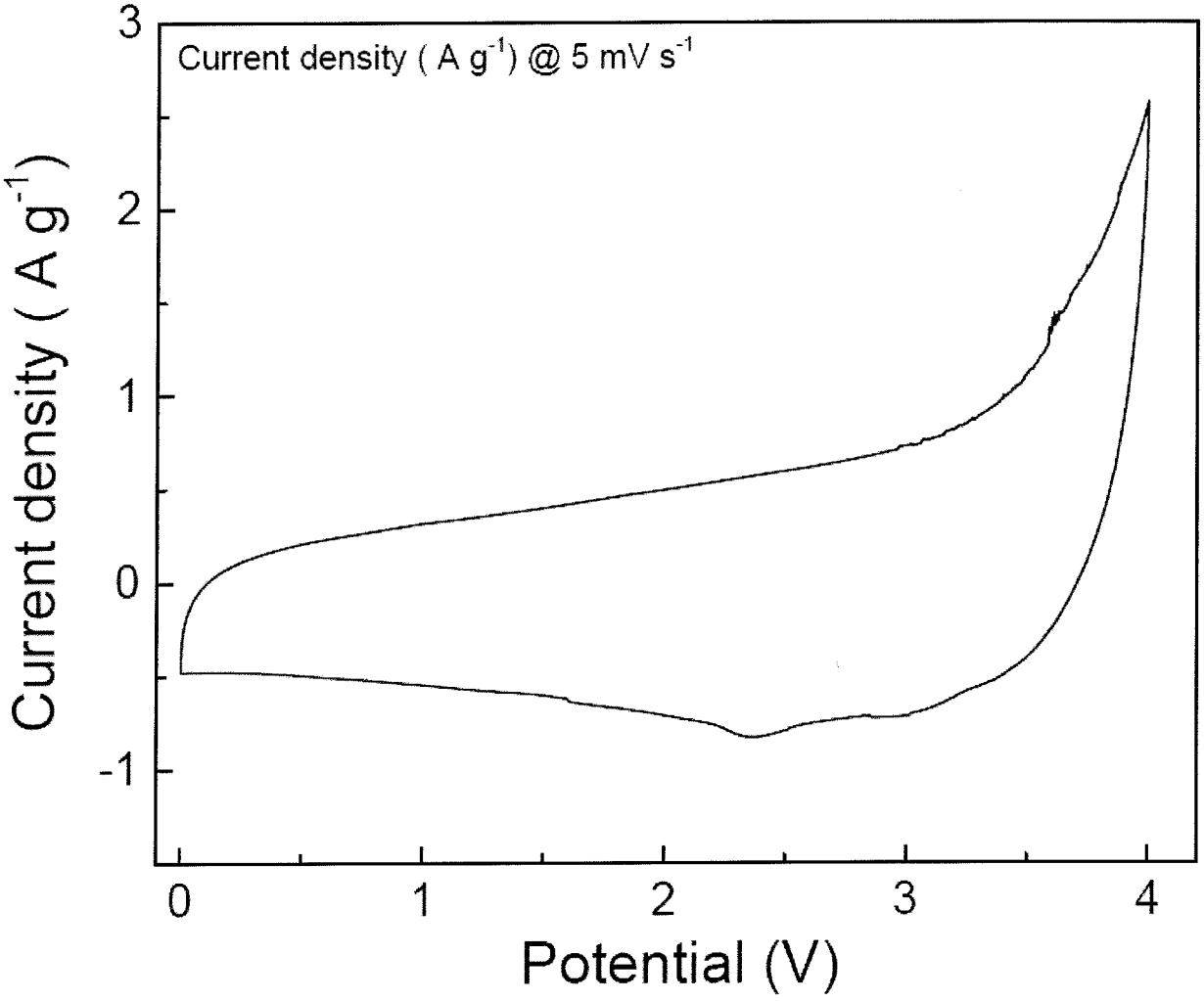

Current density ( A g-1) @ 5 mV s-1
Current density ( A g-1 )
Potential (V)
3
2
1
0
-1
0
1
2
3
4

FIG. 5

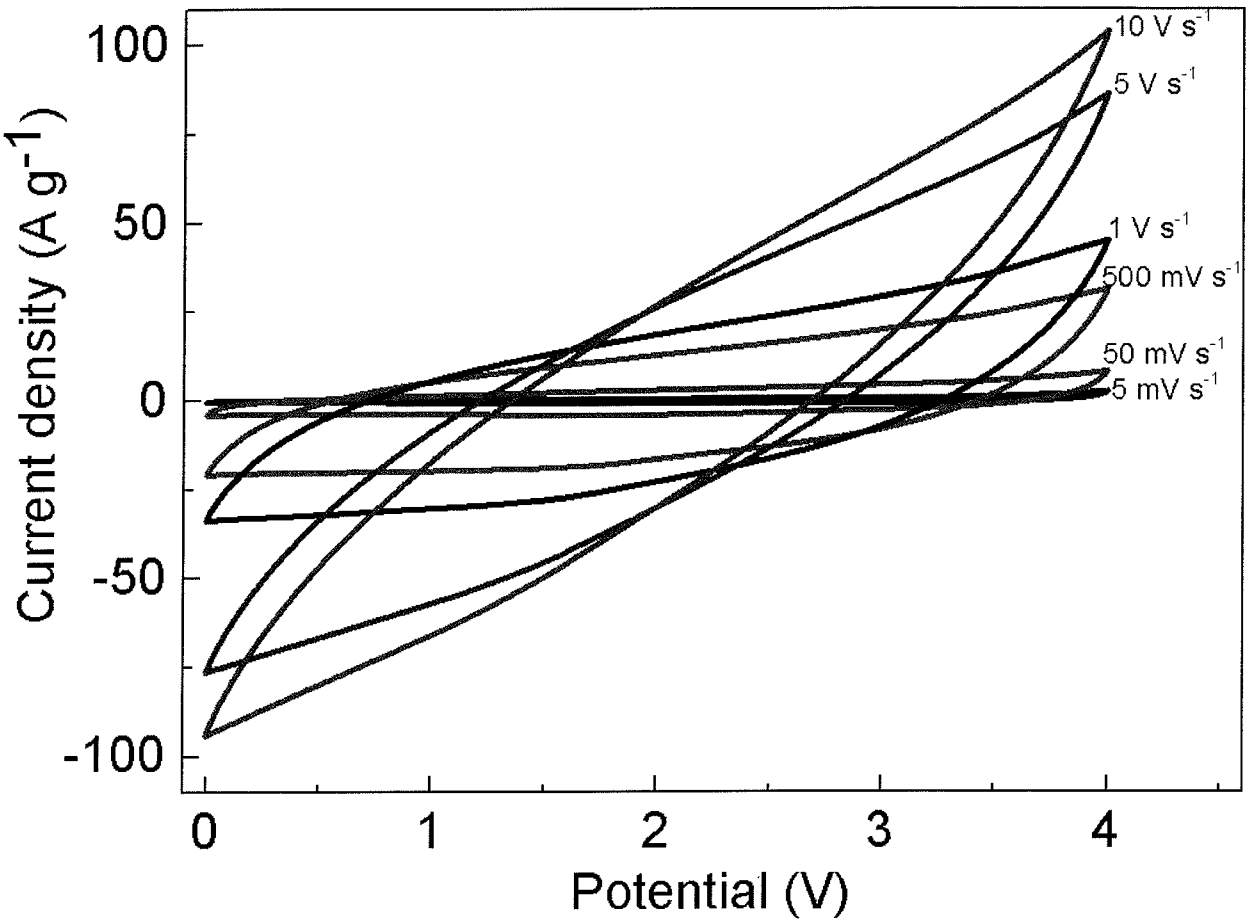

100
50
0
-50
-100
Current density (A g-1)
0
1
2
3
4
Potential (V)
10 V s-1
5 V s-1
1 V s-1
500 mV s-1
50 mV s-1
5 mV s-1

FIG. 6

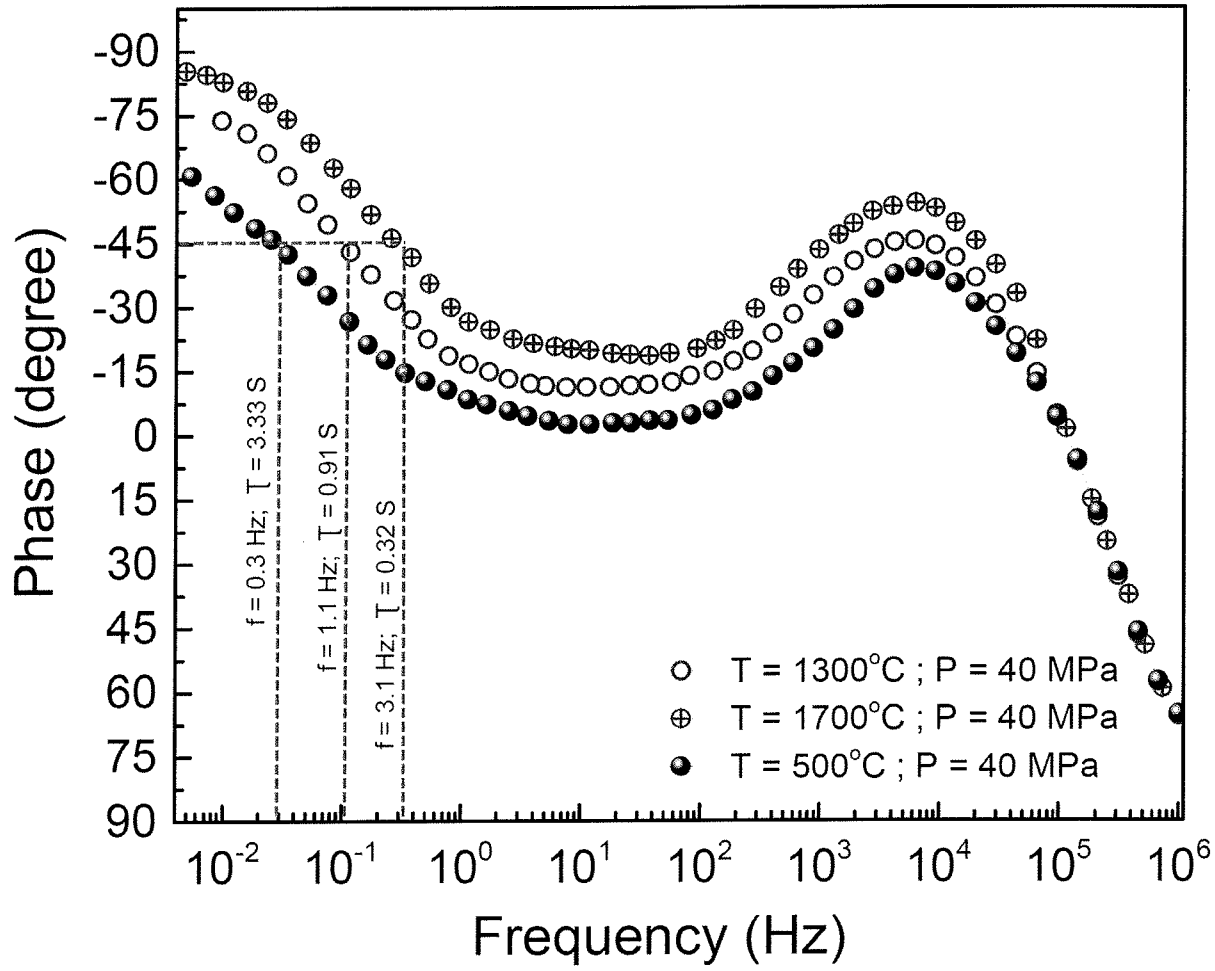
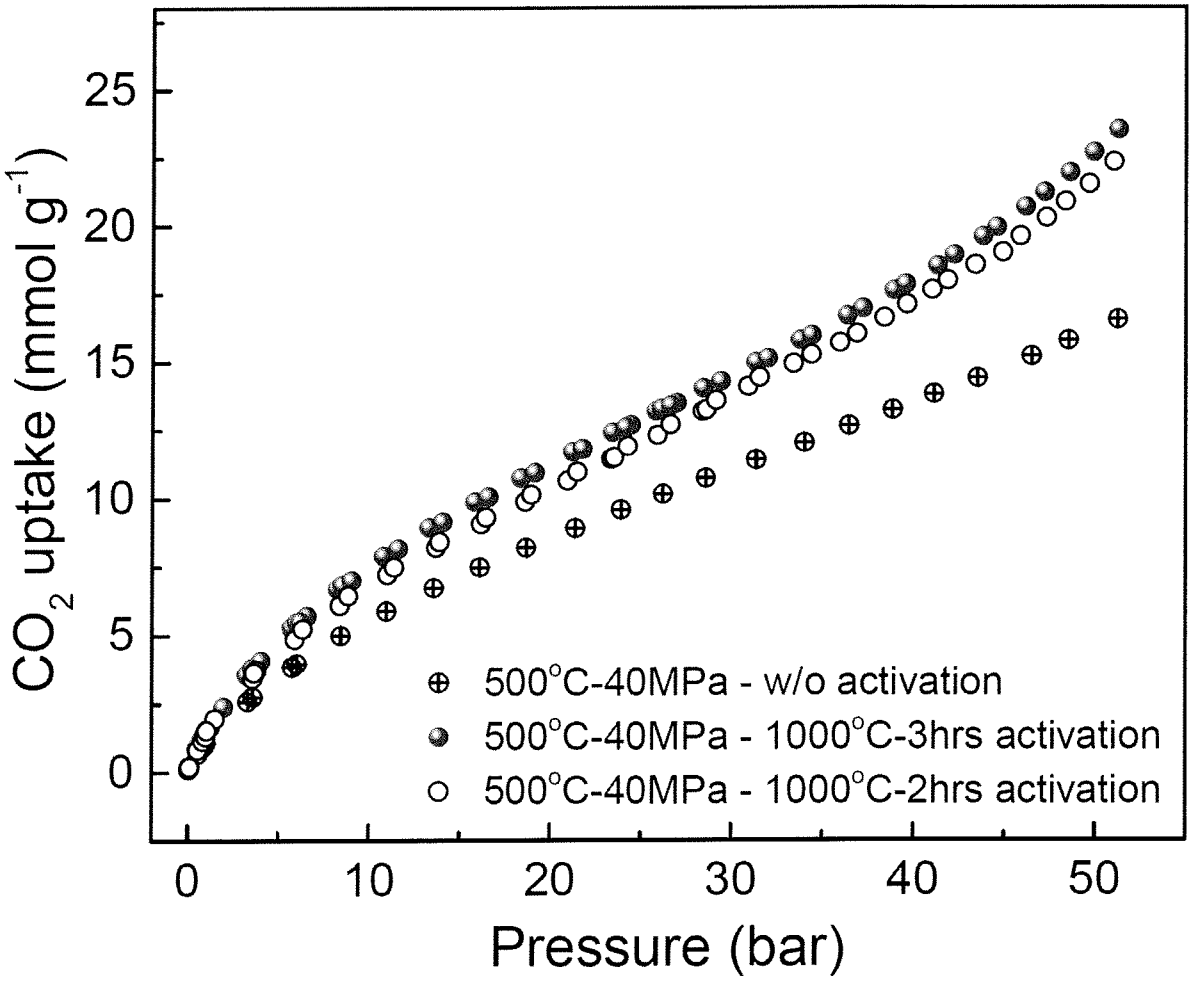

Phase (degree)
-90
-75
-60
-45
-30
-15
0
15
30
45
60
75
90
f = 0.3 Hz; T = 3.33 S
f = 1.1 Hz; T = 0.91 S
f = 3.1 Hz; T = 0.32 S
T = 1300°C ; P = 40 MPa
T = 1700°C ; P = 40 MPa
T = 500°C ; P = 40 MPa
10-2
10-1
100
101
102
103
104
105
106
Frequency (Hz)

FIG. 7


$CO_2$ uptake (mmol $g^{-1}$)
25
20
15
10
5
0
0
10
20
30
40
50
Pressure (bar)
500°C-40MPa - w/o activation
500°C-40MPa - 1000°C-3hrs activation
500°C-40MPa - 1000°C-2hrs activation