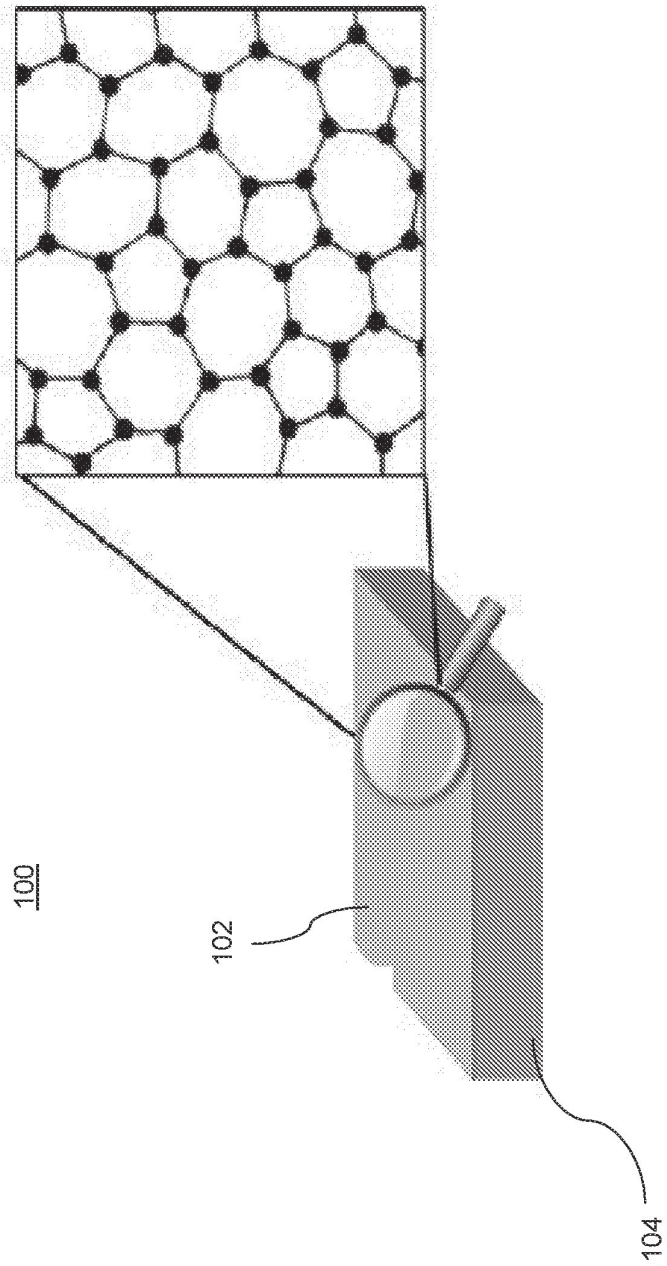


FIG. 1

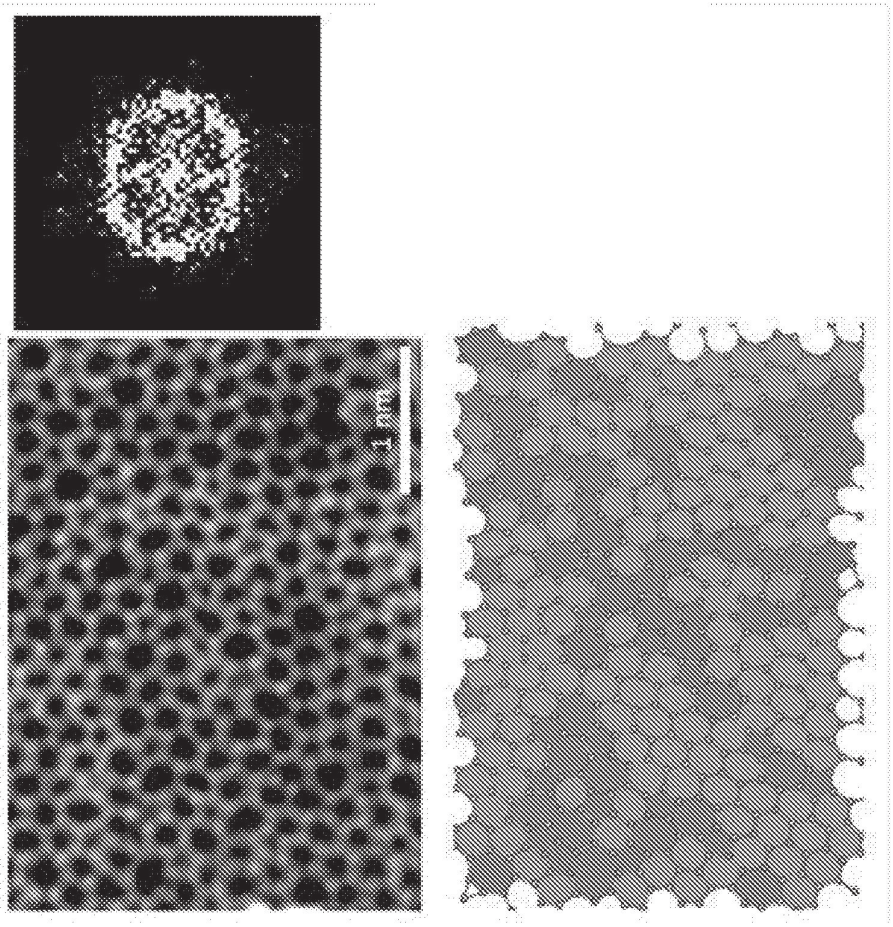


FIG. 2

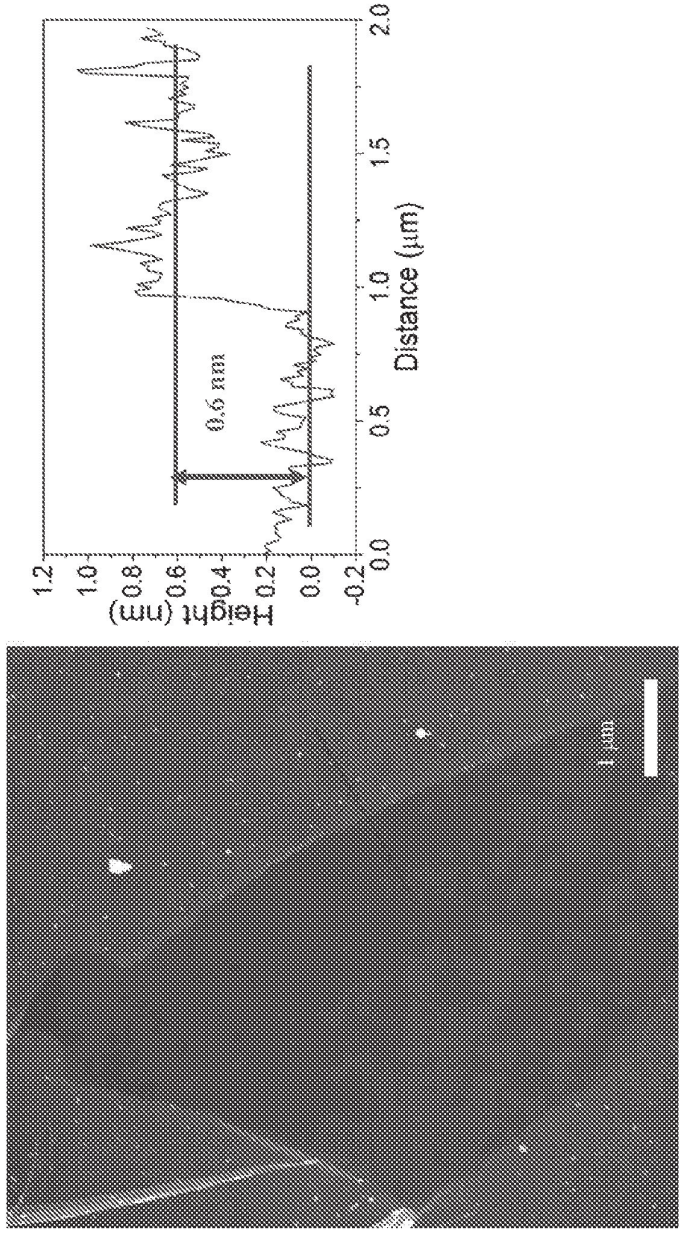

1 μm
Height (nm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
0.6 nm
0.0
0.5
1.0
1.5
2.0
Distance (μm)

FIG. 3

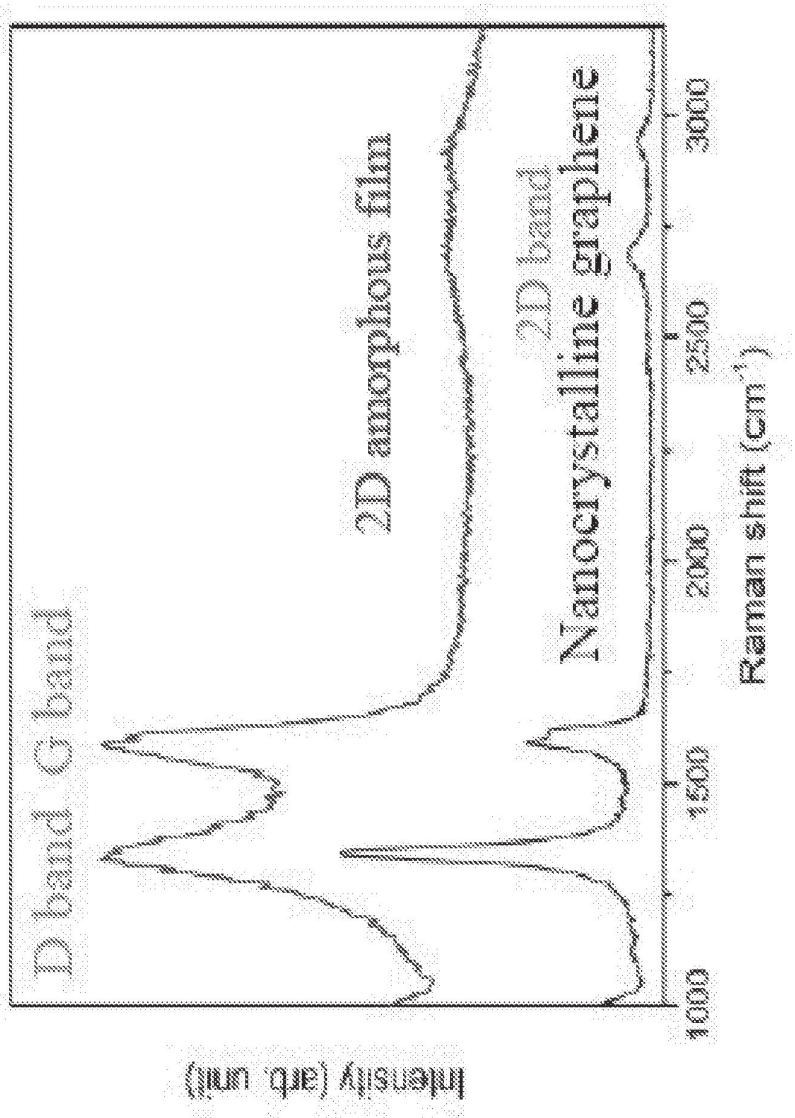

400
D band G band
2D amorphous film
2D band
Nanocrystalline graphene
Intensity (arb. unit)
1000
1500
2000
2500
3000
Raman shift (cm-1)

FIG. 4

500

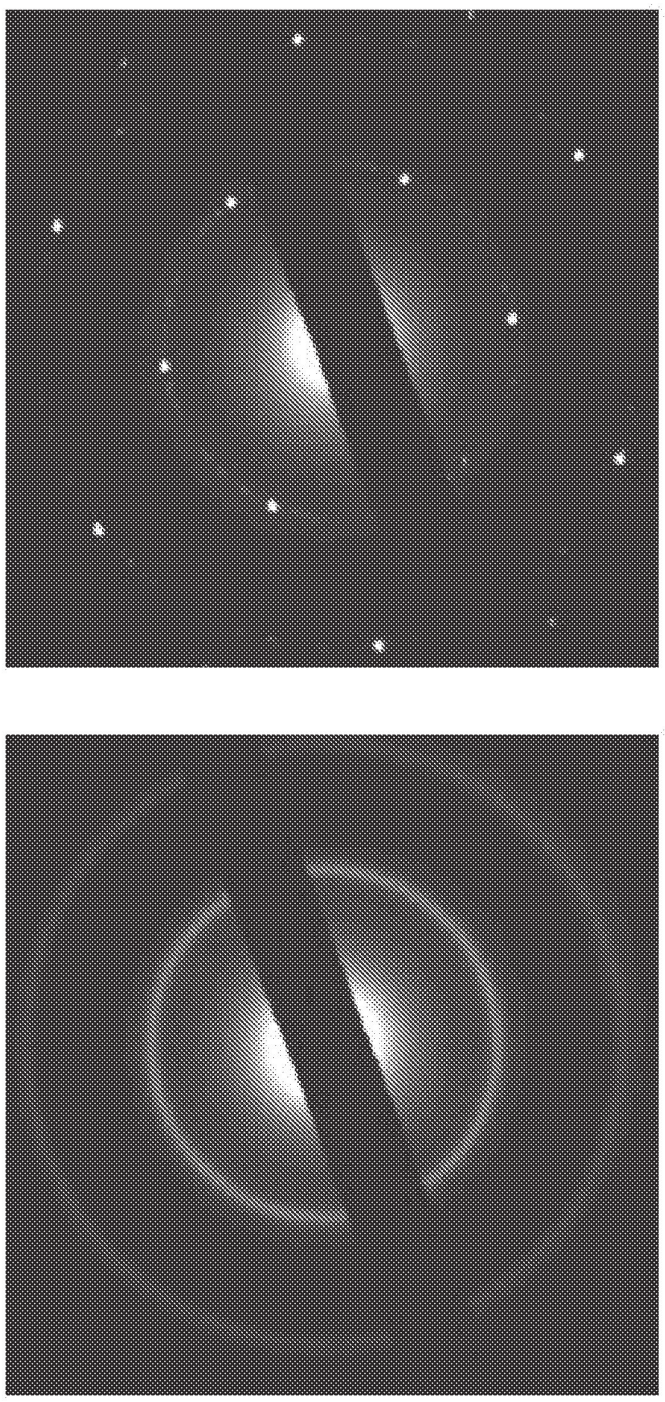


FIG. 5

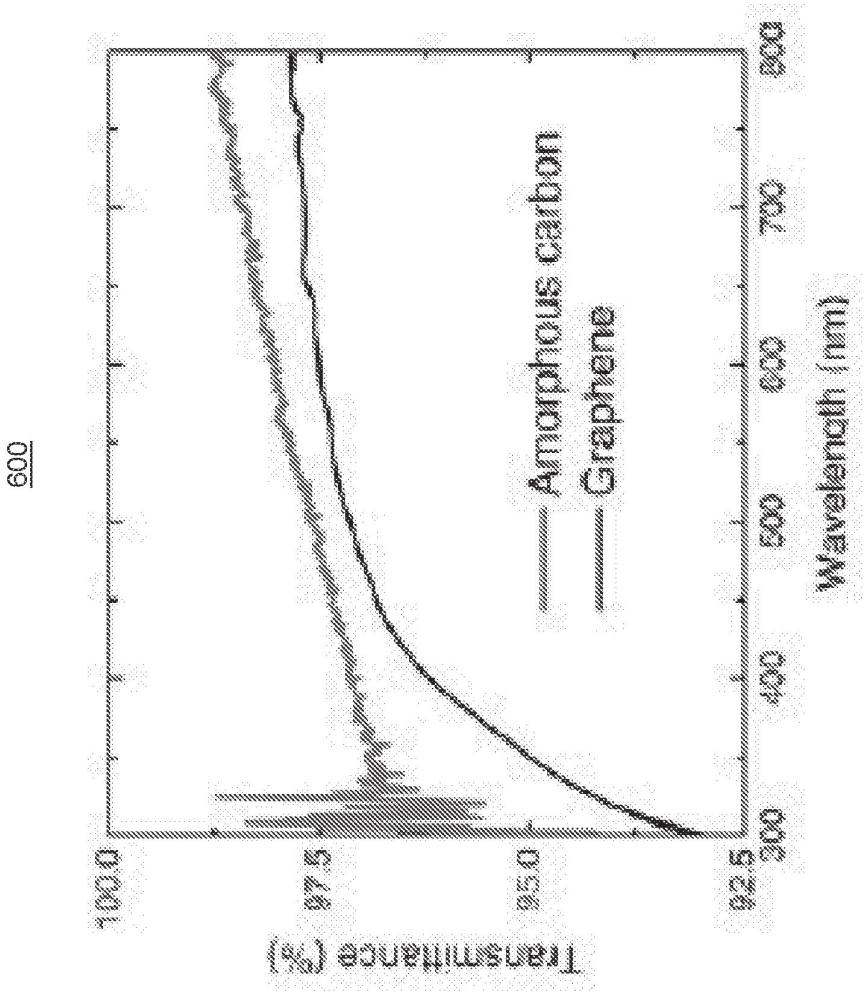
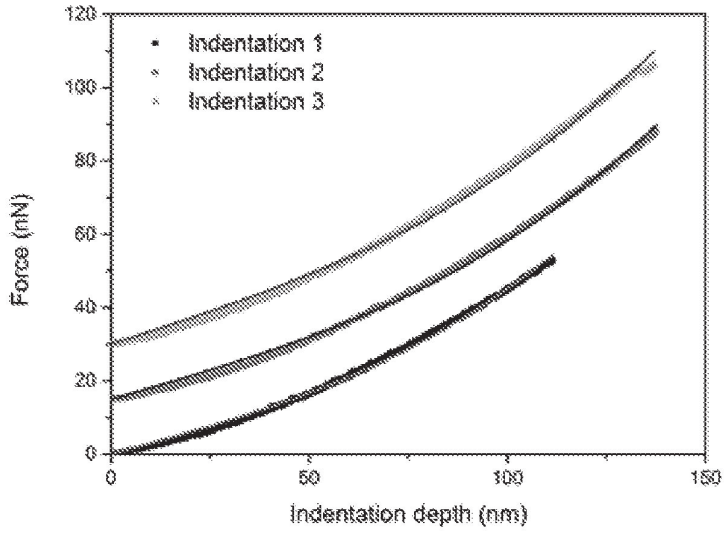

600
Transmittance (%)
100.0
97.5
95.0
92.5
200
400
600
700
800
Wavelength (nm)
Amorphous carbon
Graphene

FIG. 6


Indentation 1
Indentation 2
Indentation 3
Force (nN)
Indentation depth (nm)
0
20
40
60
80
100
120
0
50
100
150

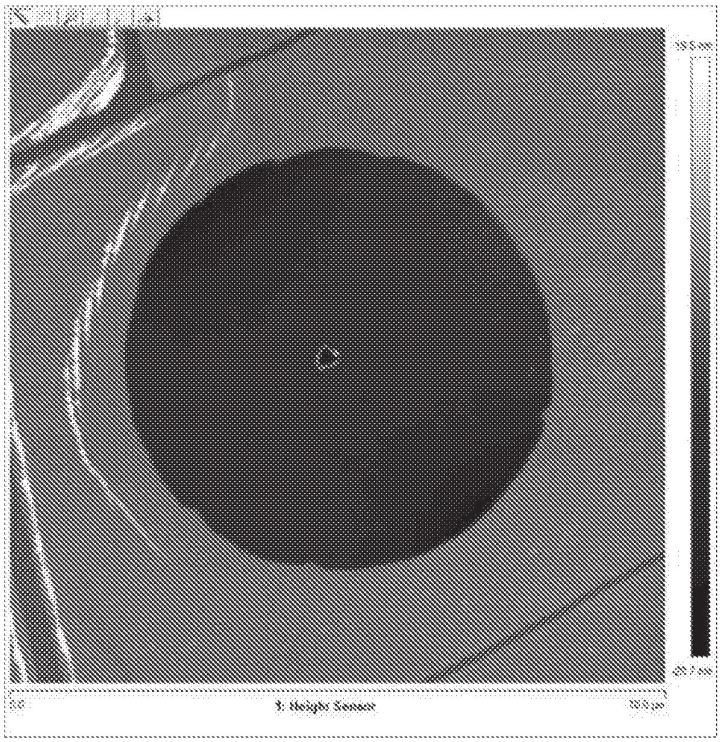


FIG. 7

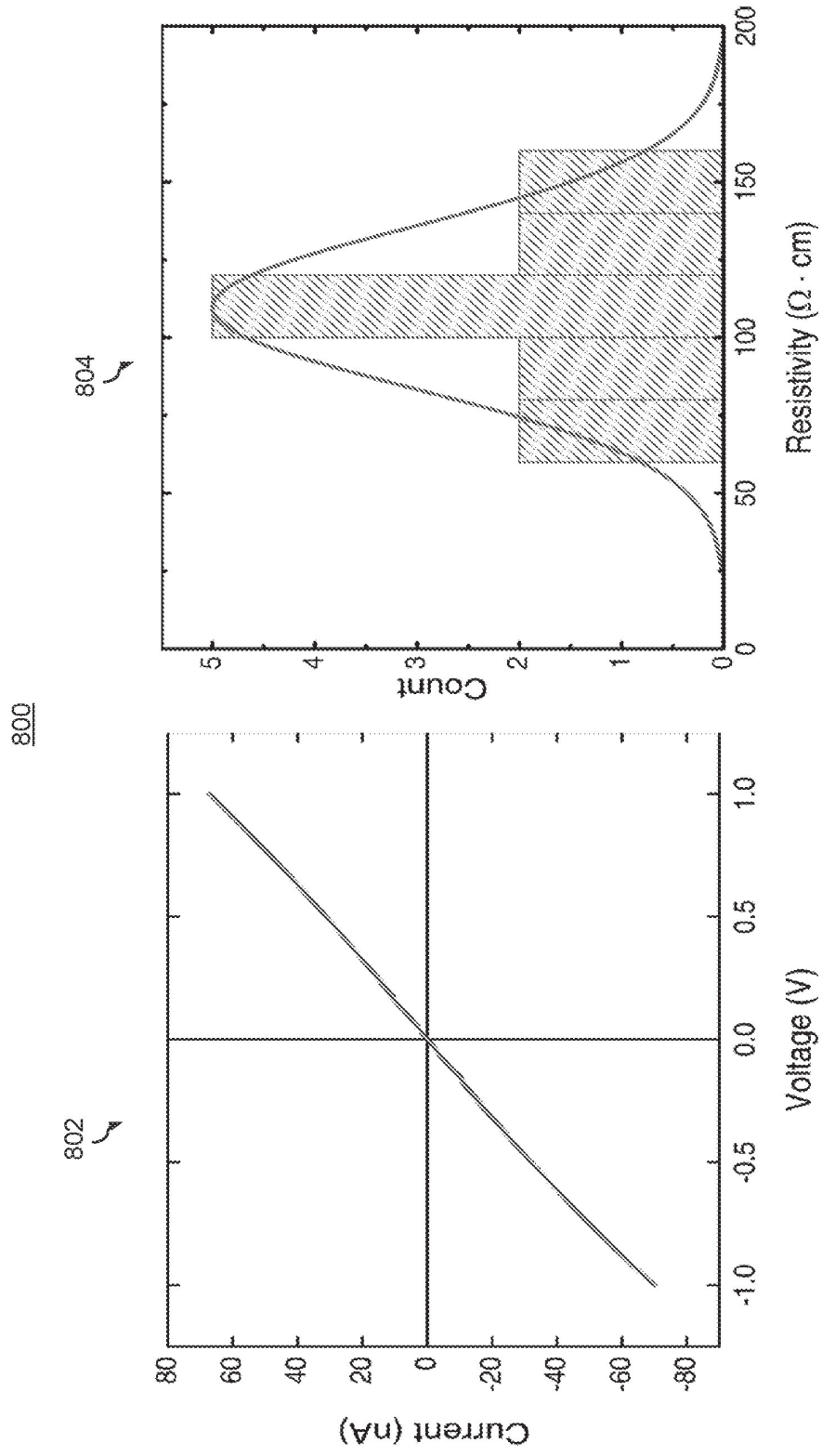

800
802
804
Current (nA)
Voltage (V)
Count
Resistivity (Ω · cm)
80
60
40
20
0
-20
-40
-60
-80
-1.0
-0.5
0.0
0.5
1.0
0
1
2
3
4
5
0
50
100
150
200

FIG. 8

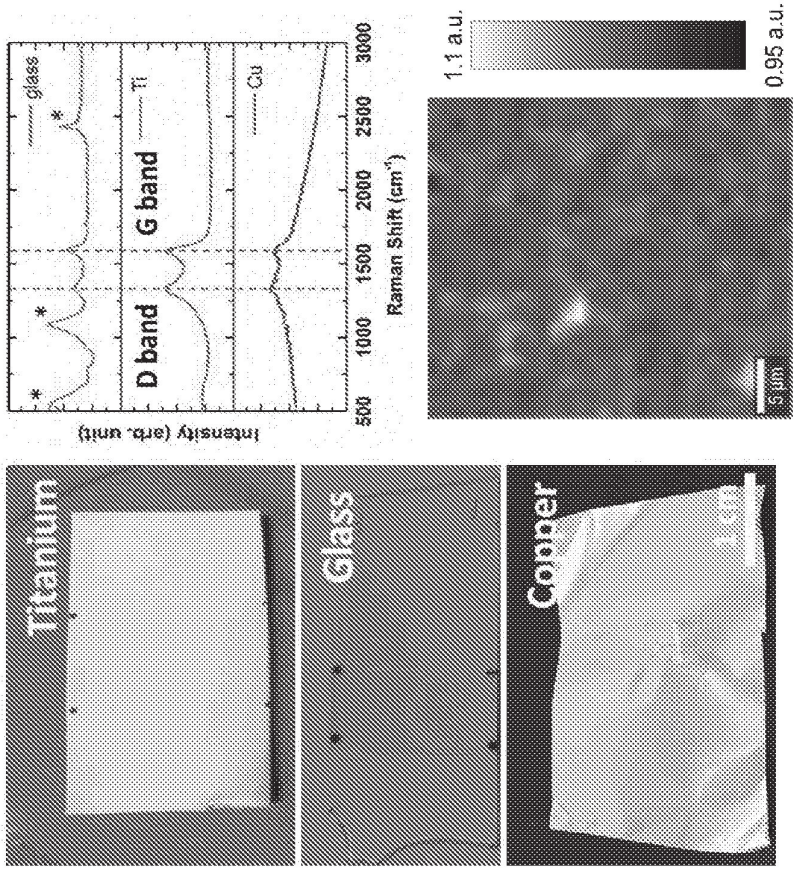

Titanium
Glass
Copper
Intensity (arb. unit)
D band
G band
glass
Ti
Cu
500
1000
1500
2000
2500
3000
Raman Shift (cm⁻¹)
1.1 a.u.
0.95 a.u.
5 μm

FIG. 9

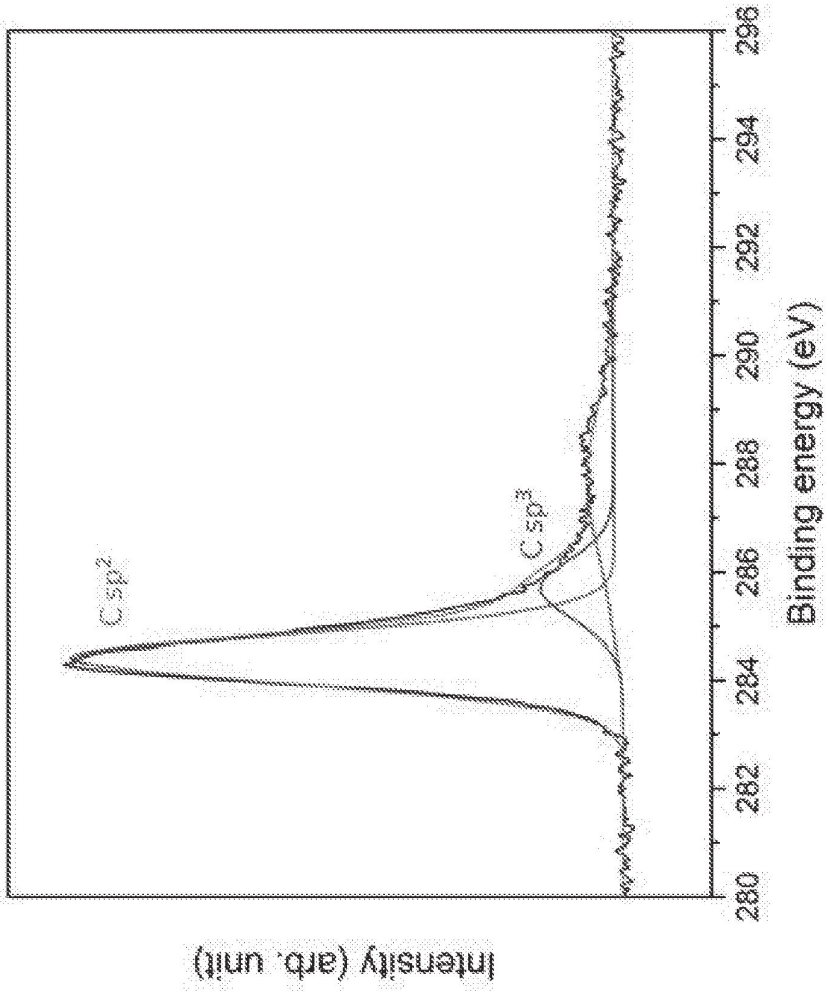

C sp2
C sp3
280
282
284
286
288
290
292
294
296
Binding energy (eV)
Intensity (arb. unit)

FIG. 10

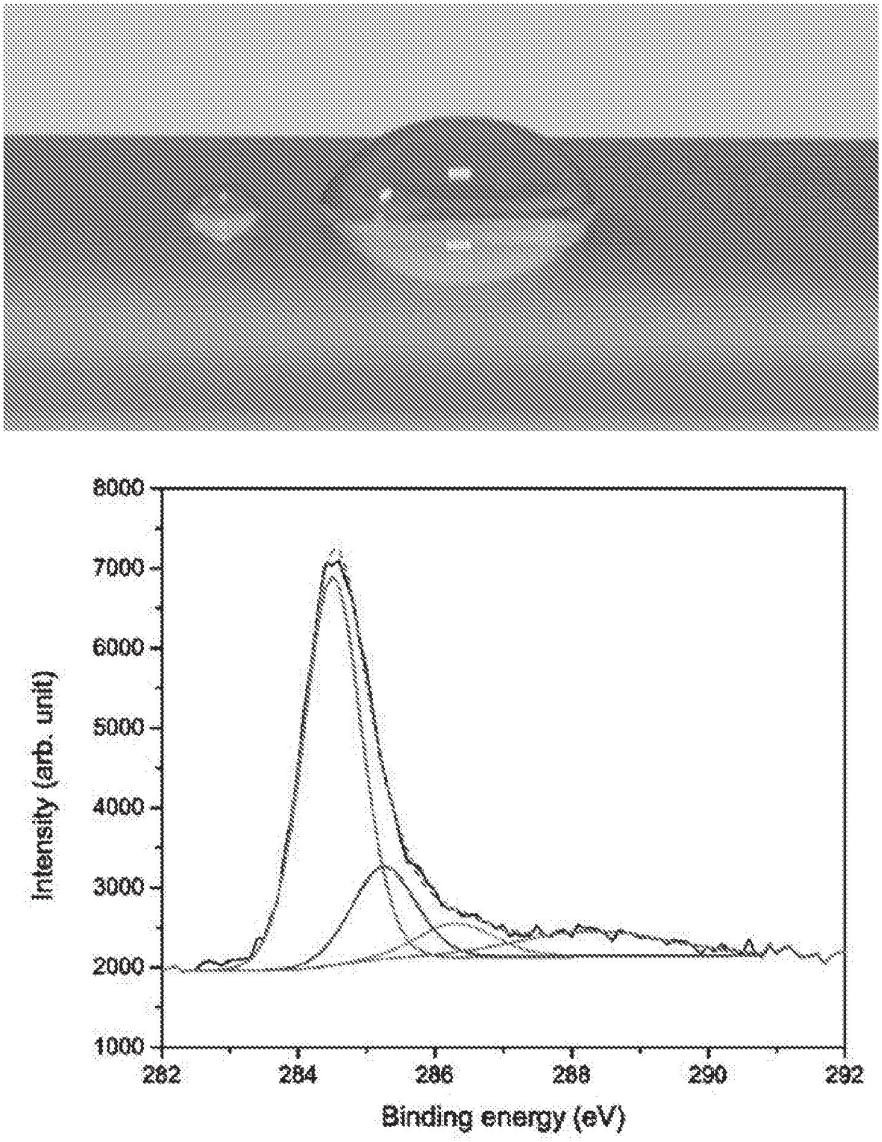

8000
7000
6000
5000
4000
3000
2000
1000
Intensity (arb. unit)
282
284
286
288
290
292
Binding energy (eV)

FIG. 11

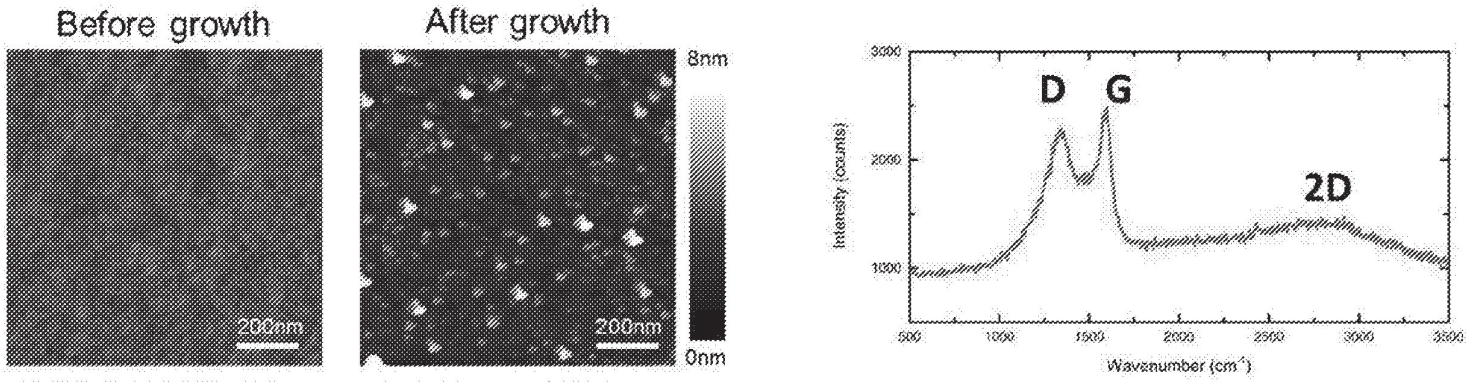

Before growth
After growth
200nm
200nm
8nm
0nm
Roughness = 0.28nm
Roughness = 0.93nm
D
G
2D
Intensity (counts)
Wavenumber (cm⁻¹)

FIG. 12

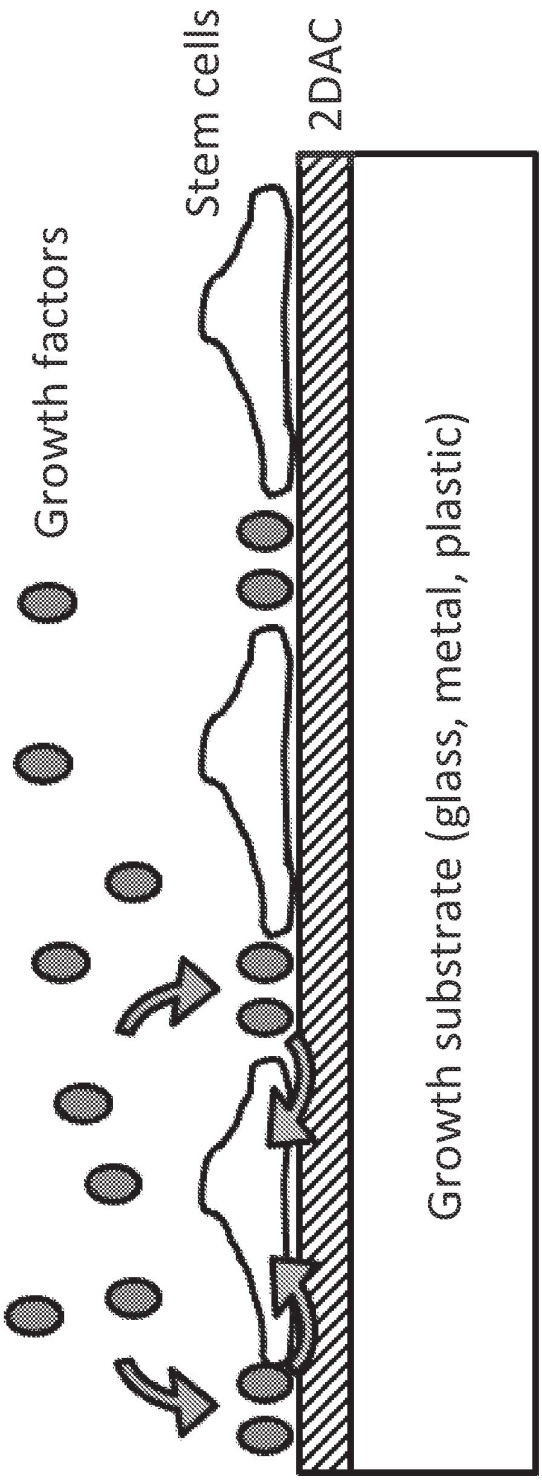
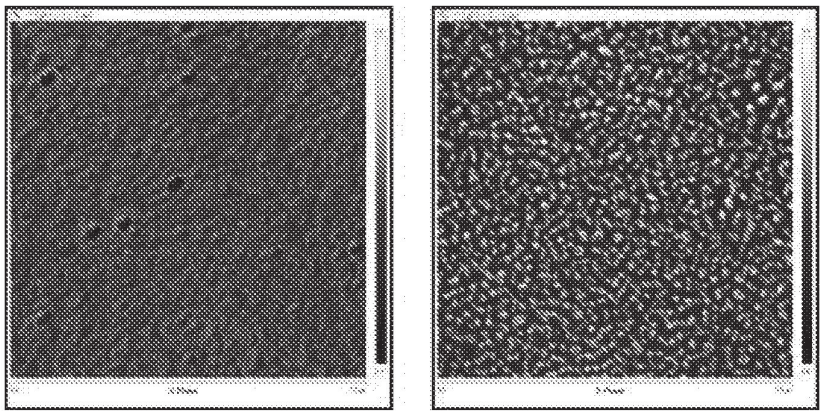

Growth factors
Stem cells
2DAC
Growth substrate (glass, metal, plastic)

FIG. 13



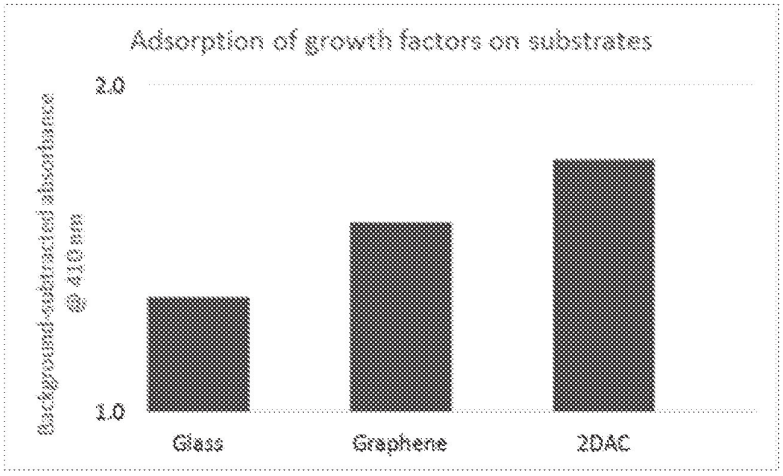

Adsorption of growth factors on substrates
Background-subtracted absorbance @ 410 nm
2.0
1.0
Glass
Graphene
2DAC

FIG. 14

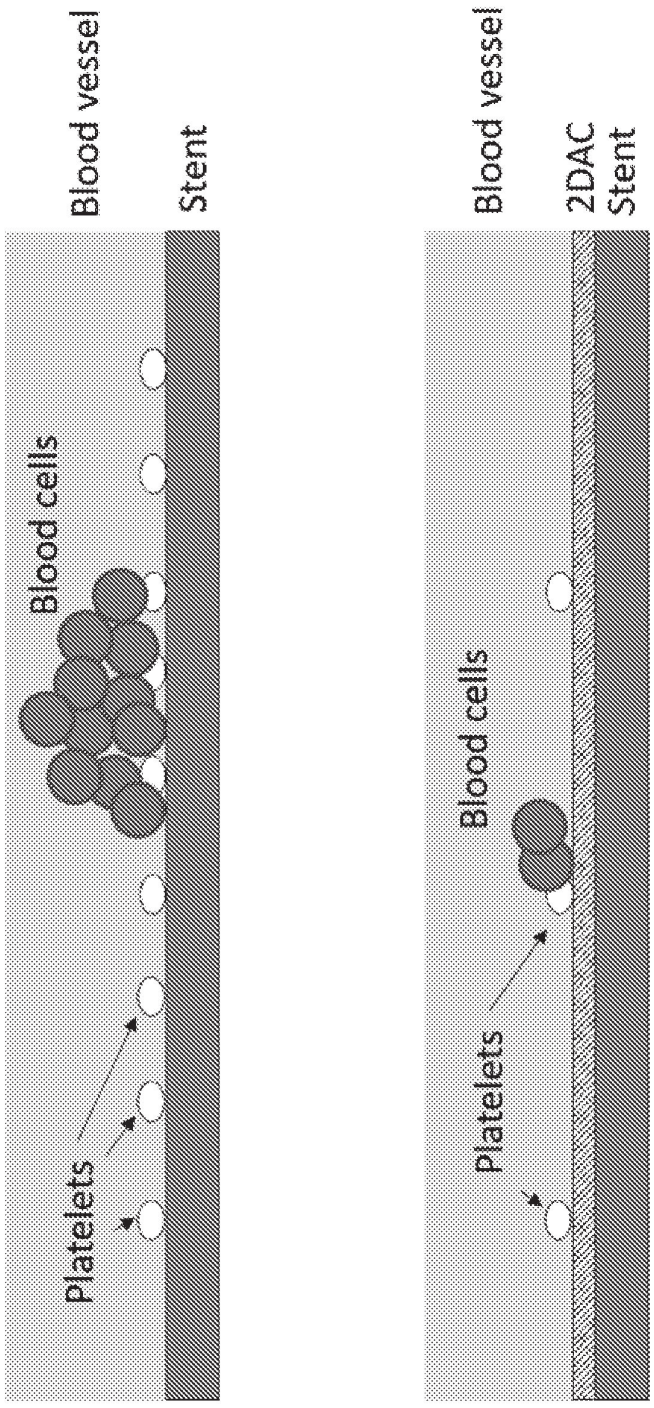

Blood vessel
Stent
Blood cells
Platelets
Blood vessel
2DAC
Stent
Blood cells
Platelets

FIG. 15

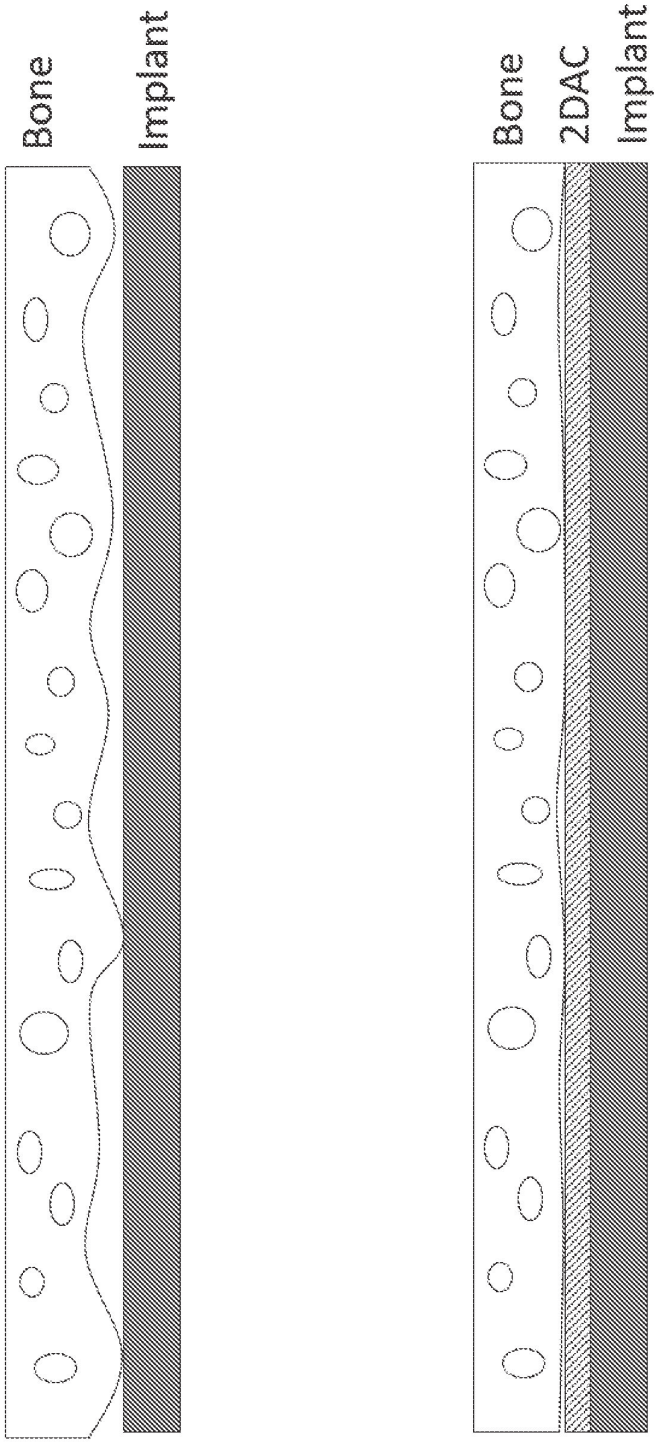


FIG. 16

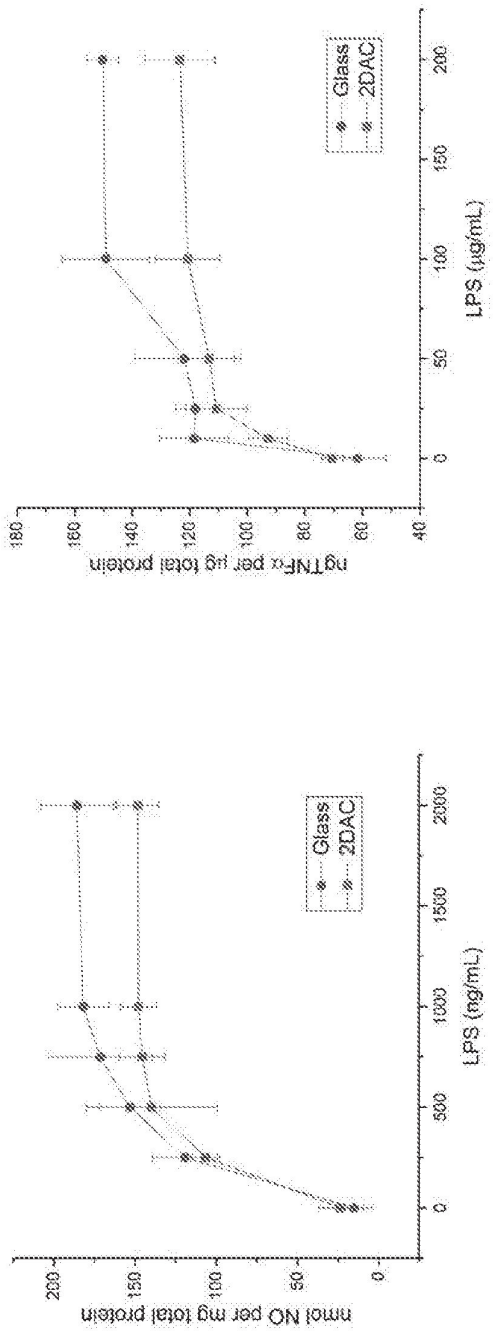

ng TNF-α per µg total protein
180
160
140
120
100
80
60
40
0
50
100
150
200
LPS (µg/mL)
Glass
2DAC
nmol NO per mg total protein
200
150
100
50
0
0
500
1000
1500
2000
LPS (ng/mL)
Glass
2DAC

FIG. 17