FIG. 1A

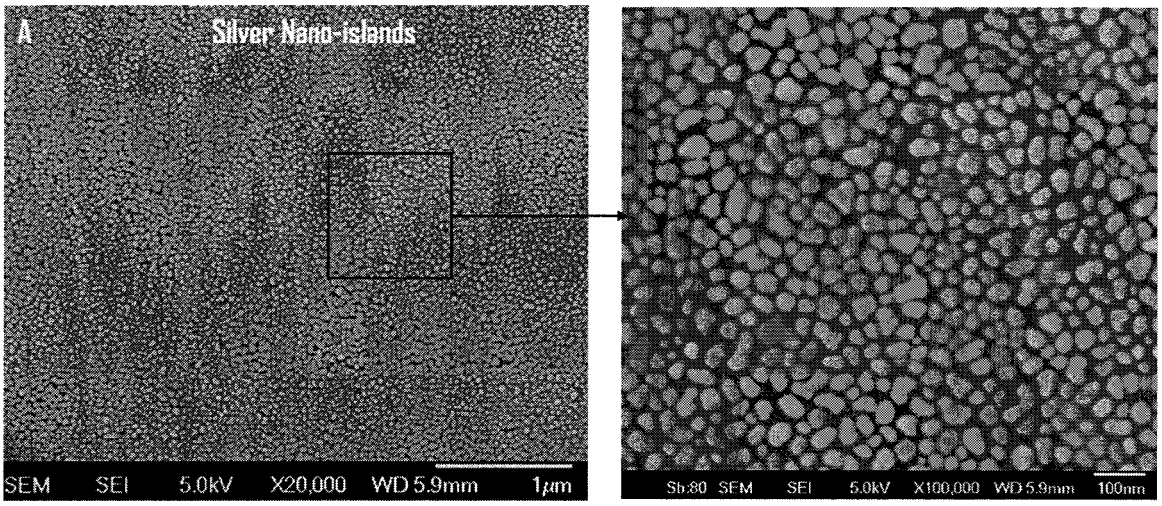


FIG. 1B

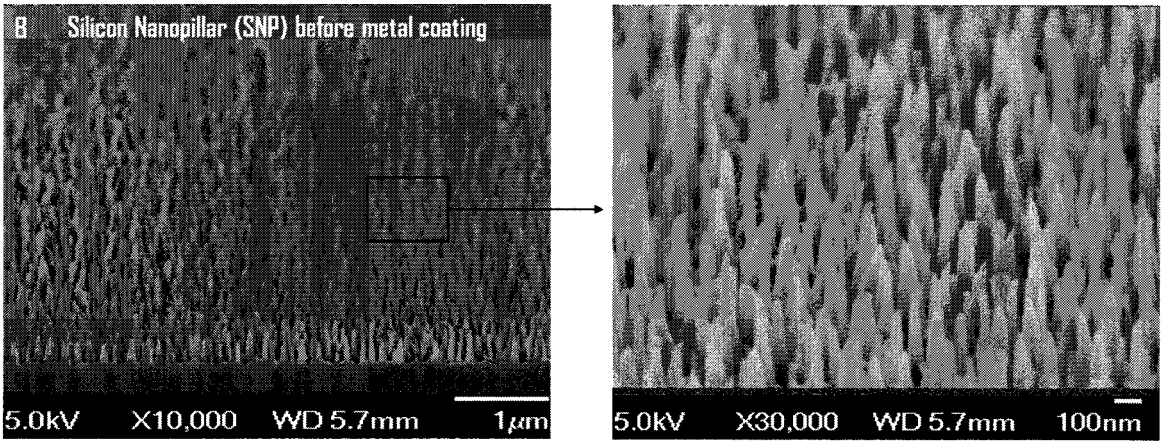


FIG. 1C

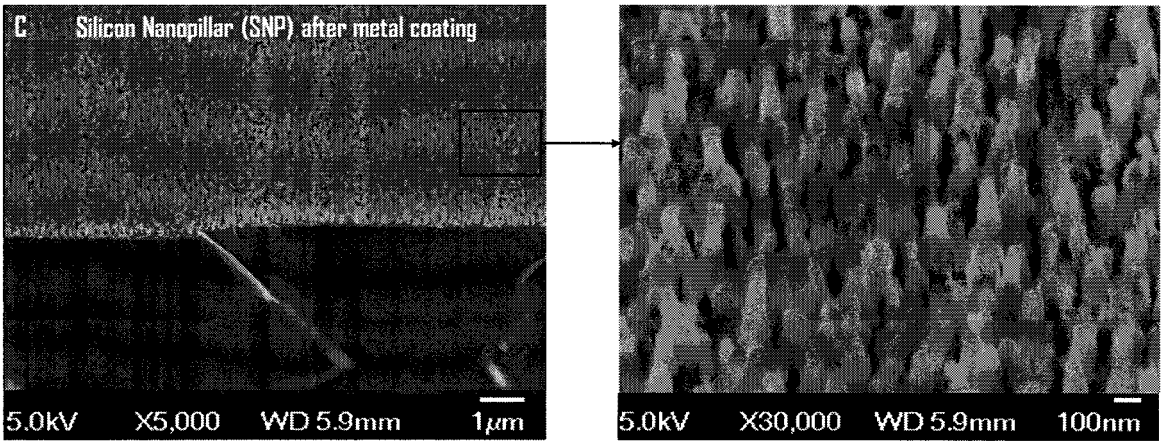


FIG. 1D

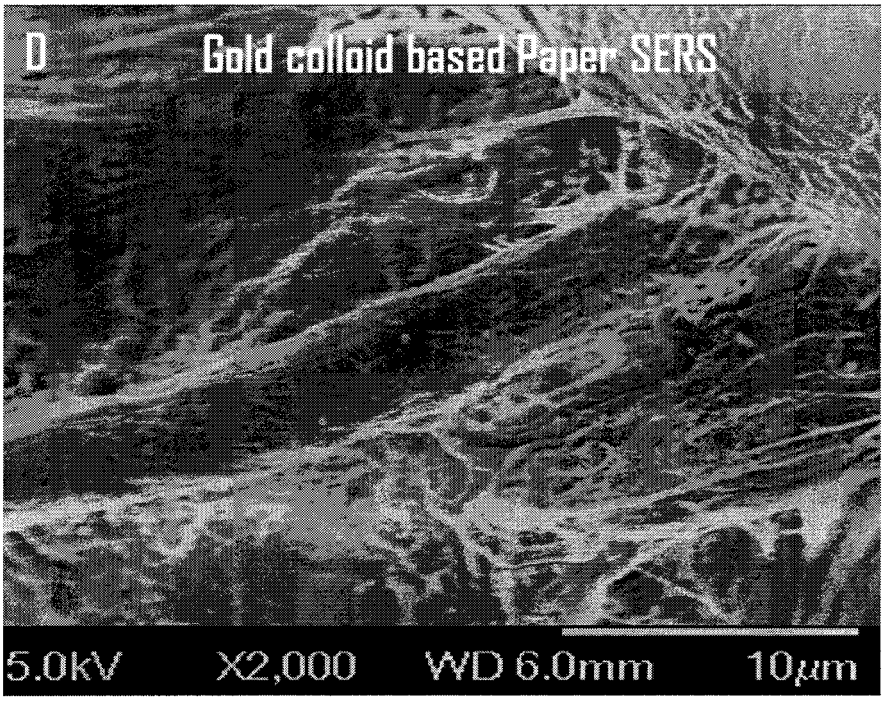

D
Gold colloid based Paper SERS
5.0kV X2,000 WD 6.0mm 10μm

FIG. 1E

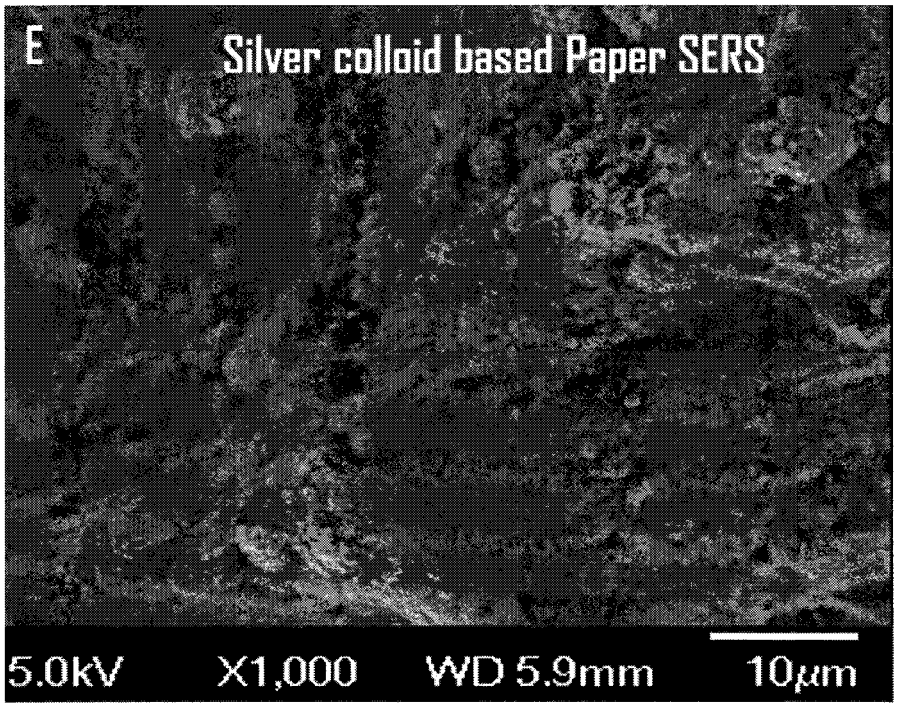

E
Silver colloid based Paper SERS
5.0kV X1,000 WD 5.9mm 10μm

FIG. 2

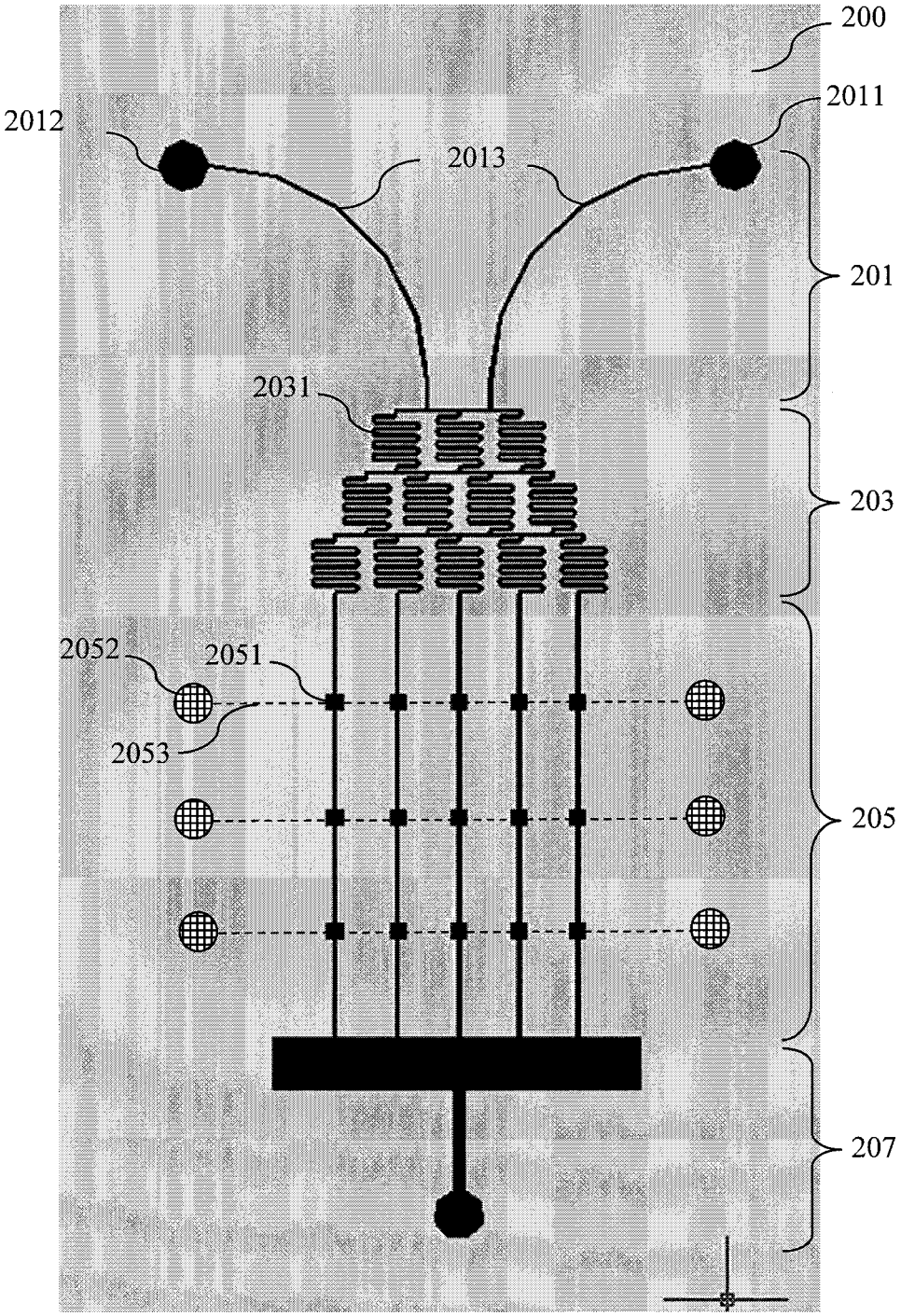


FIG. 3

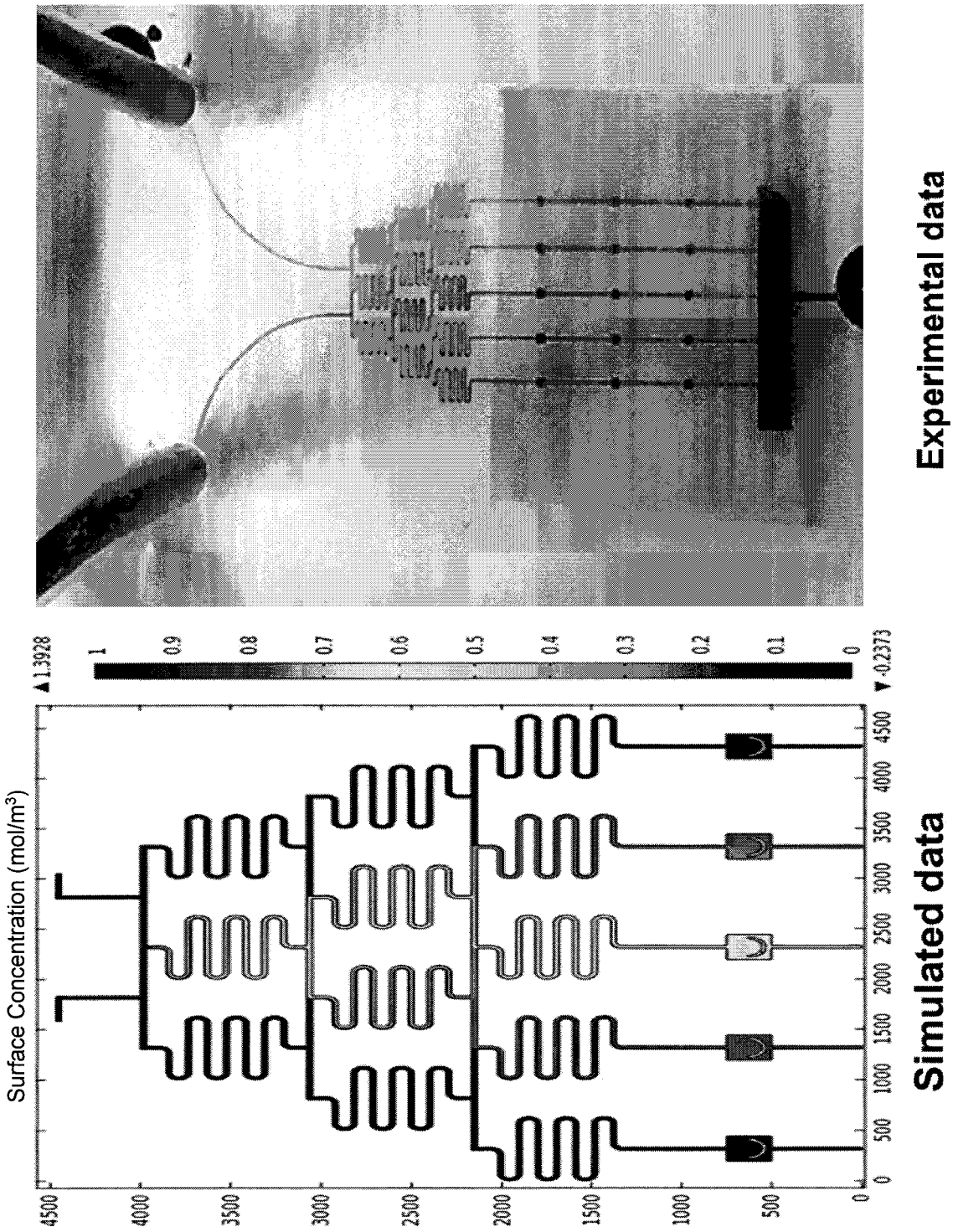

Experimental data
Simulated data
Surface Concentration (mol/m3)
▲1.3928
▼-0.2373
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500

FIG. 4A

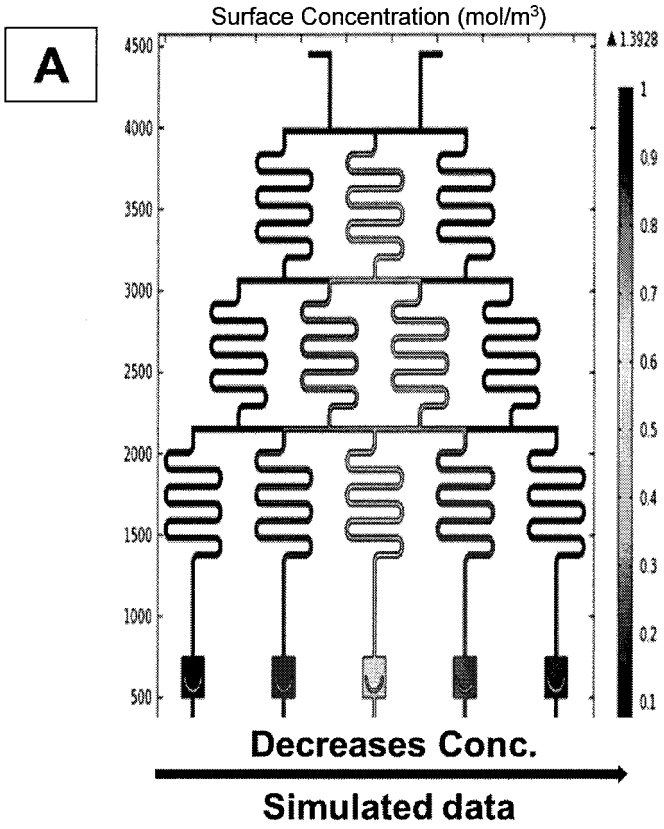

A
Surface Concentration (mol/m3)
4500
4000
3500
3000
2500
2000
1500
1000
500
1.3928
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Decreases Conc.
Simulated data

FIG. 4B

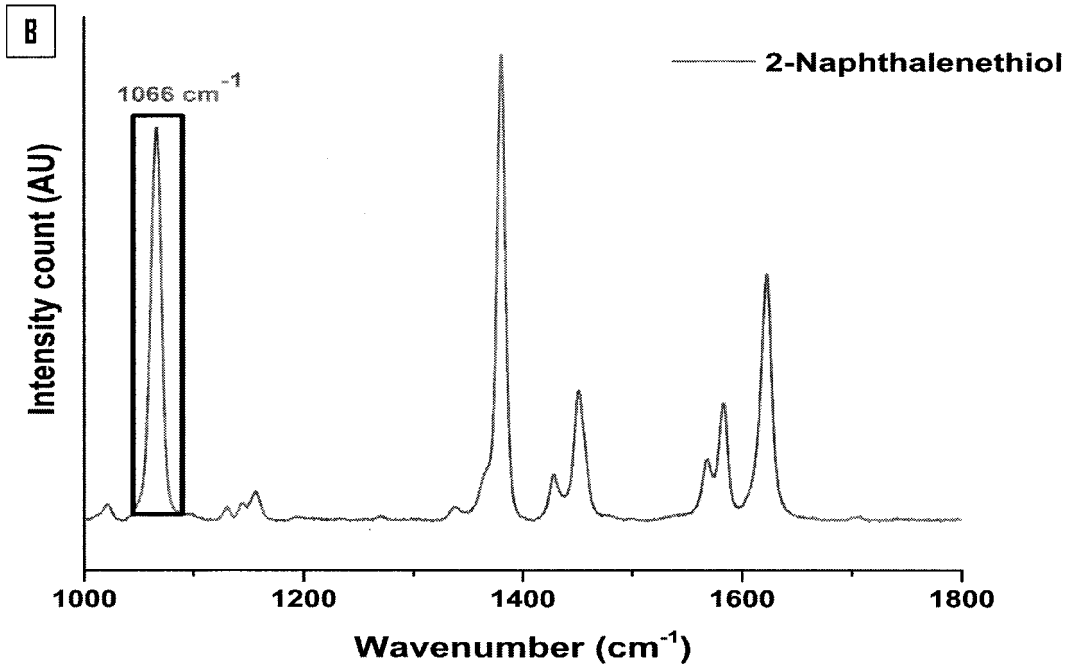

B
1066 cm-1
2-Naphthalenethiol
Intensity count (AU)
1000
1200
1400
1600
1800
Wavenumber (cm-1)

FIG. 4C

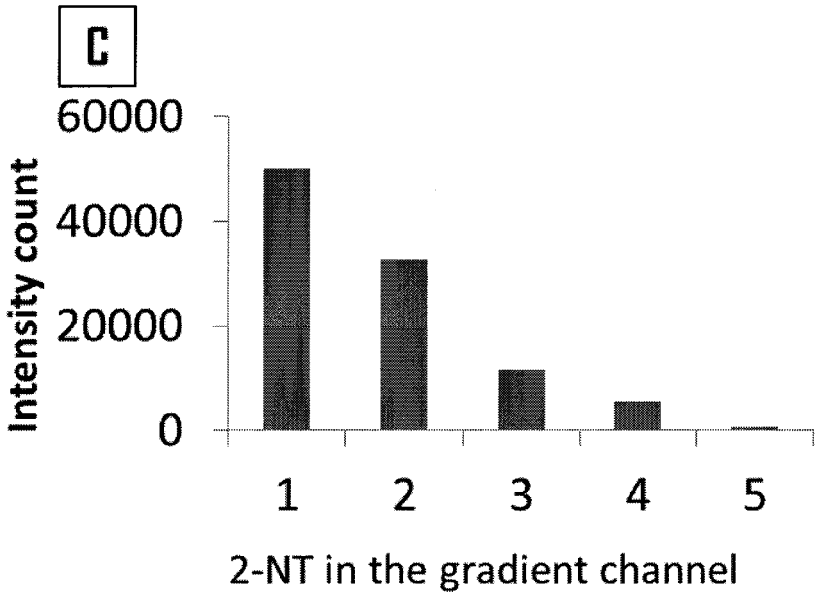


FIG. 4D

D

Microchannel	Raman Intensity	Estimated 2-NT conc. (uM) [Simulation Data]
1	50126	9.55
2	32658	8.13
3	11740	6.78
4	5553	4.39
5	710	2.01

FIG. 5

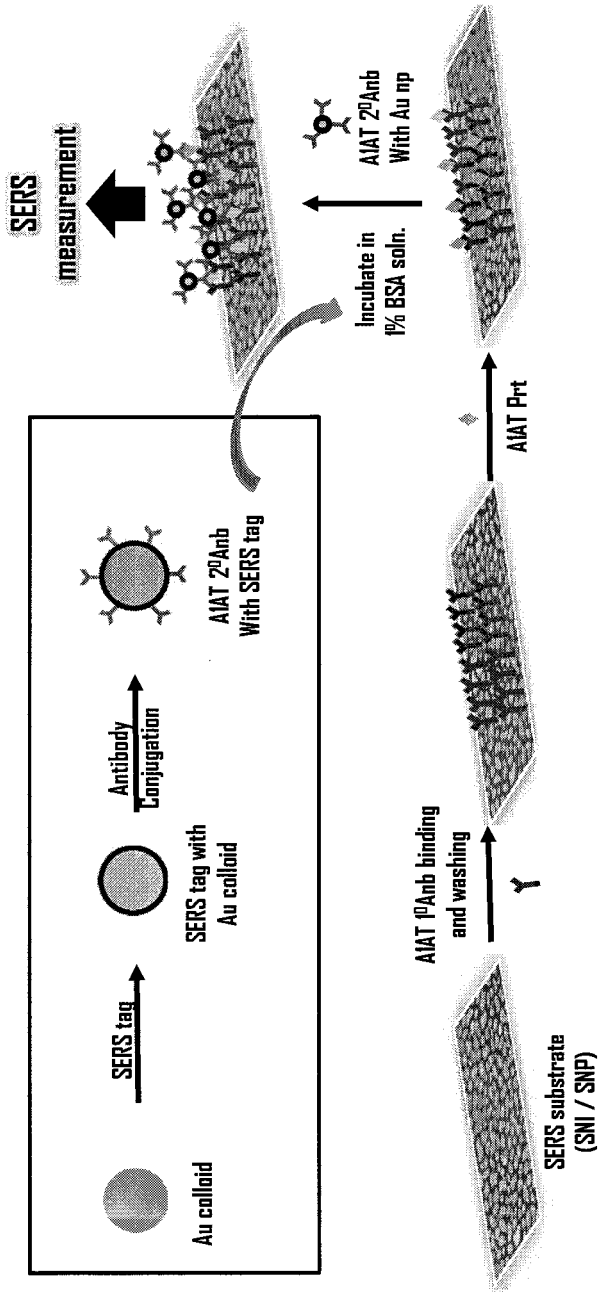

SERS substrate (SNI / SNP)
AIAT 1°Anb binding and washing
AIAT Prt
AIAT 2°Anb With Au np
Incubate in 1% BSA soln.
SERS measurement
Au colloid
SERS tag
SERS tag with Au colloid
Antibody Conjugation
AIAT 2°Anb With SERS tag

FIG. 6

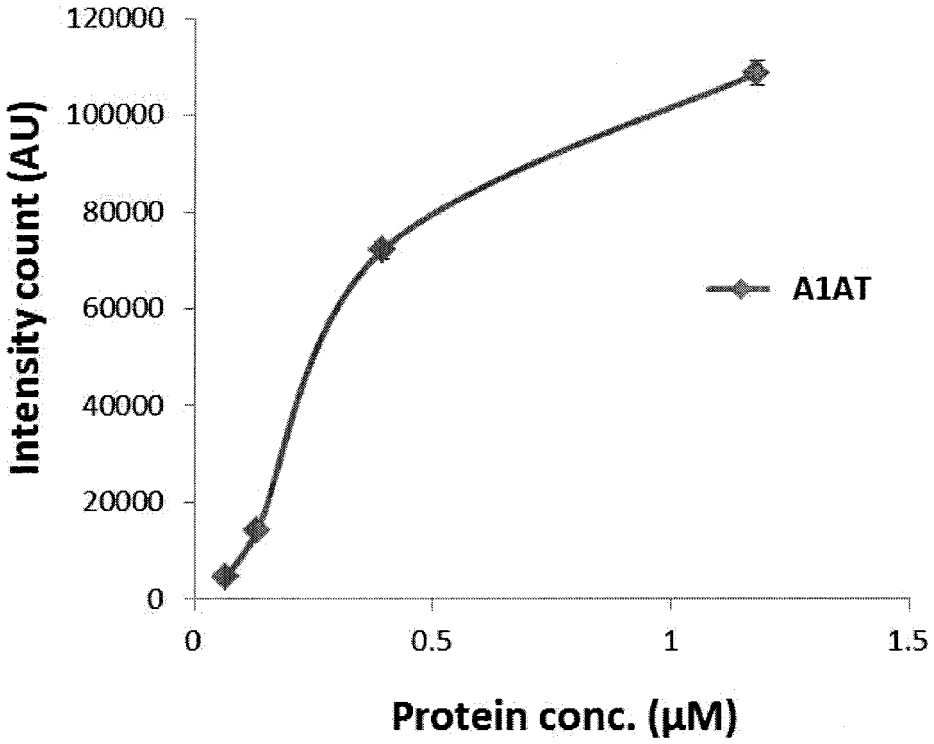

120000
100000
80000
60000
40000
20000
0
Intensity count (AU)
0
0.5
1
1.5
Protein conc. (µM)
A1AT

FIG. 7

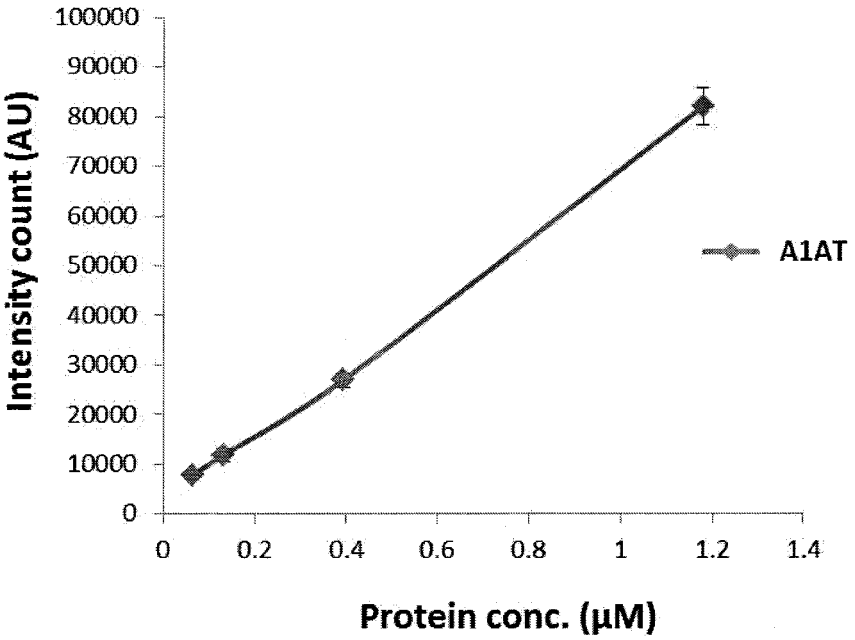

100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Intensity count (AU)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Protein conc. (µM)
A1AT

FIG. 8

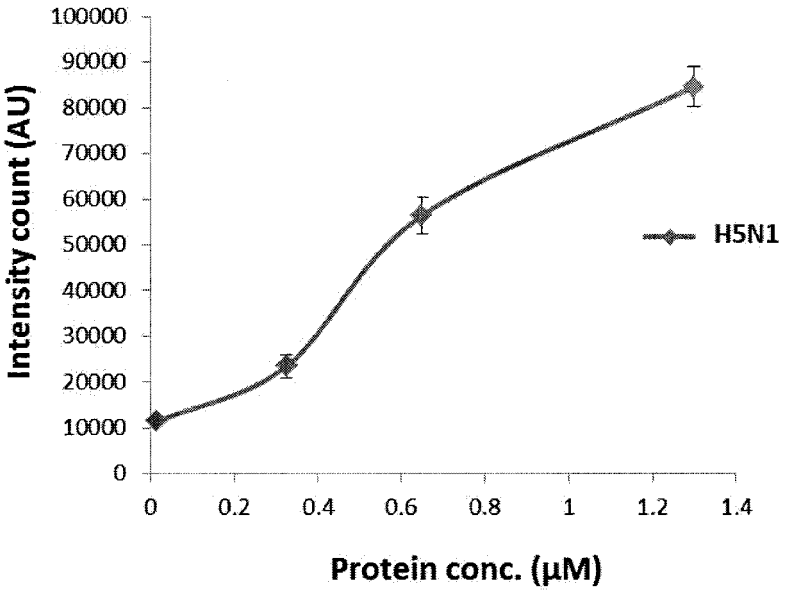

100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Intensity count (AU)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Protein conc. (µM)
H5N1

FIG. 9

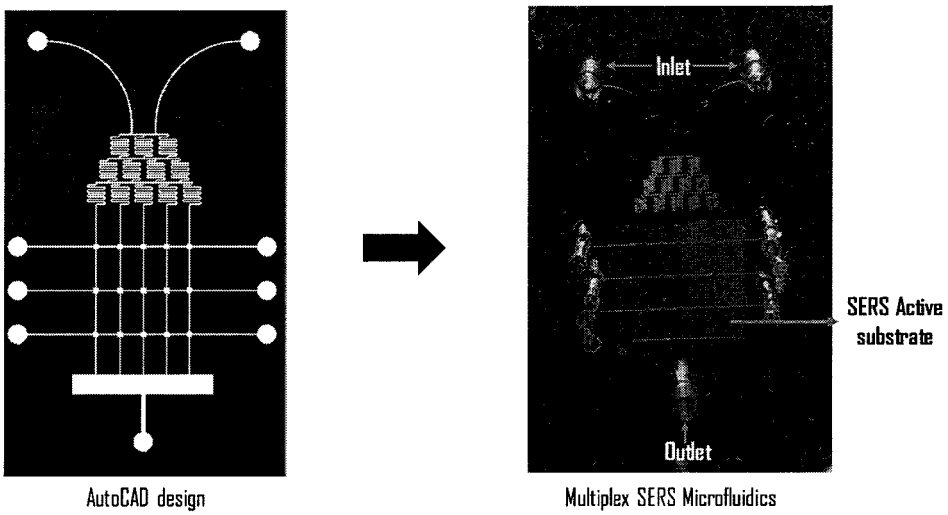

Inlet
SERS Active substrate
Outlet
AutoCAD design
Multiplex SERS Microfluidics

FIG. 10

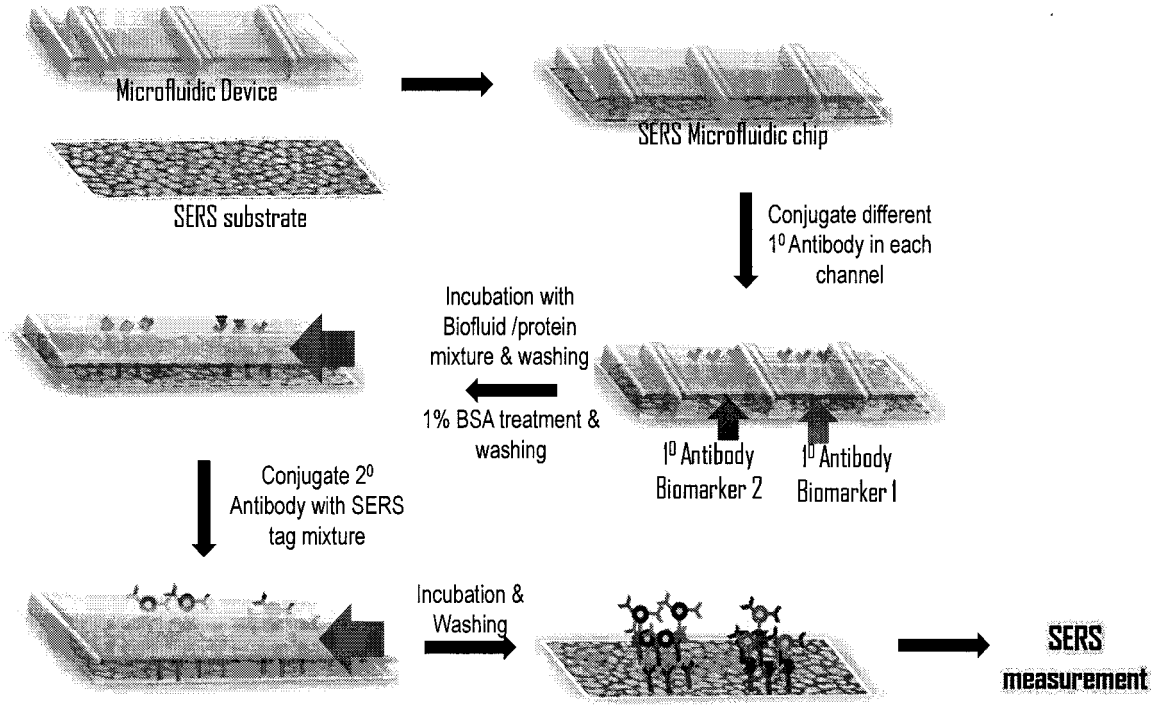

Microfluidic Device
SERS substrate
SERS Microfluidic chip
Conjugate different 1⁰ Antibody in each channel
Incubation with Biofluid /protein mixture & washing
1% BSA treatment & washing
1⁰ Antibody Biomarker 2
1⁰ Antibody Biomarker 1
Conjugate 2⁰ Antibody with SERS tag mixture
Incubation & Washing
SERS measurement

FIG. 11

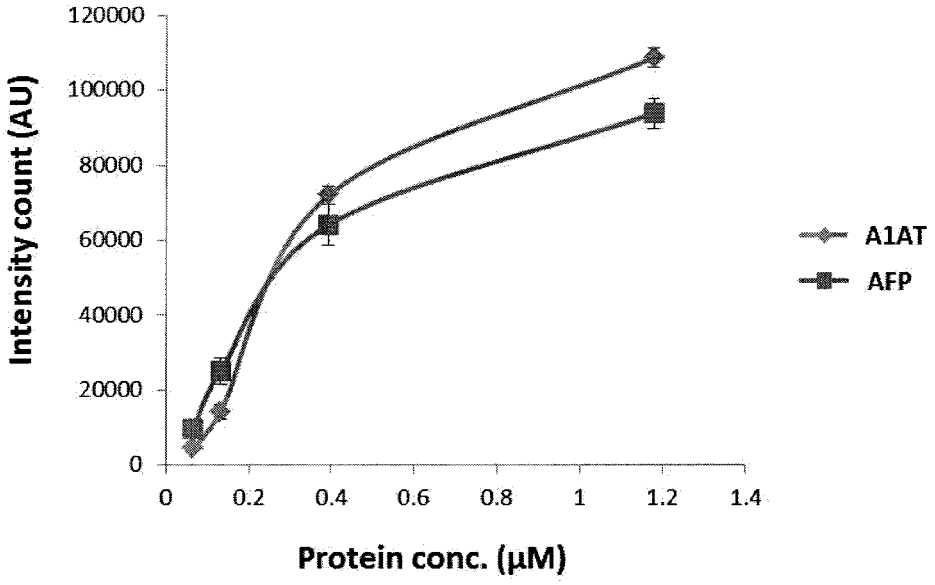

120000
100000
80000
60000
40000
20000
0
Intensity count (AU)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Protein conc. (µM)
A1AT
AFP

FIG. 12

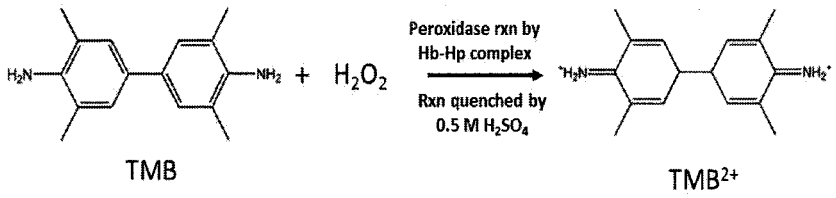

Peroxidase rxn by
Hb-Hp complex
Rxn quenched by
0.5 M H2SO4
TMB
TMB2+

FIG. 13

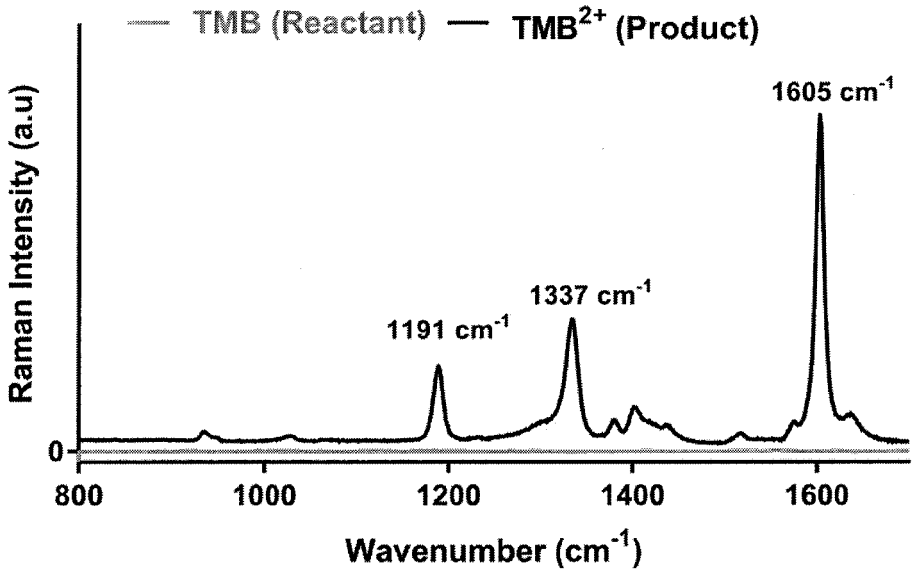
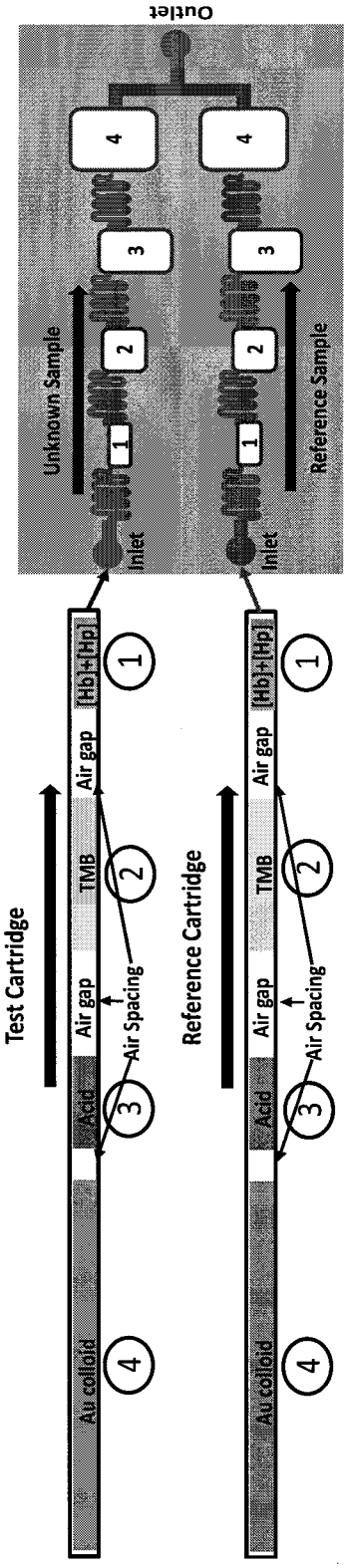

TMB (Reactant)
TMB2+ (Product)
1605 cm-1
1337 cm-1
1191 cm-1
Raman Intensity (a.u)
0
800
1000
1200
1400
1600
Wavenumber (cm-1)

FIG. 14


Outlet
4
3
2
1
Unknown Sample
Reference Sample
Inlet
Inlet
Test Cartridge
Reference Cartridge
[Hb]+[Hp]
Air gap
TMB
Air gap
Acid
Air Spacing
Au colloid