FIG. 1

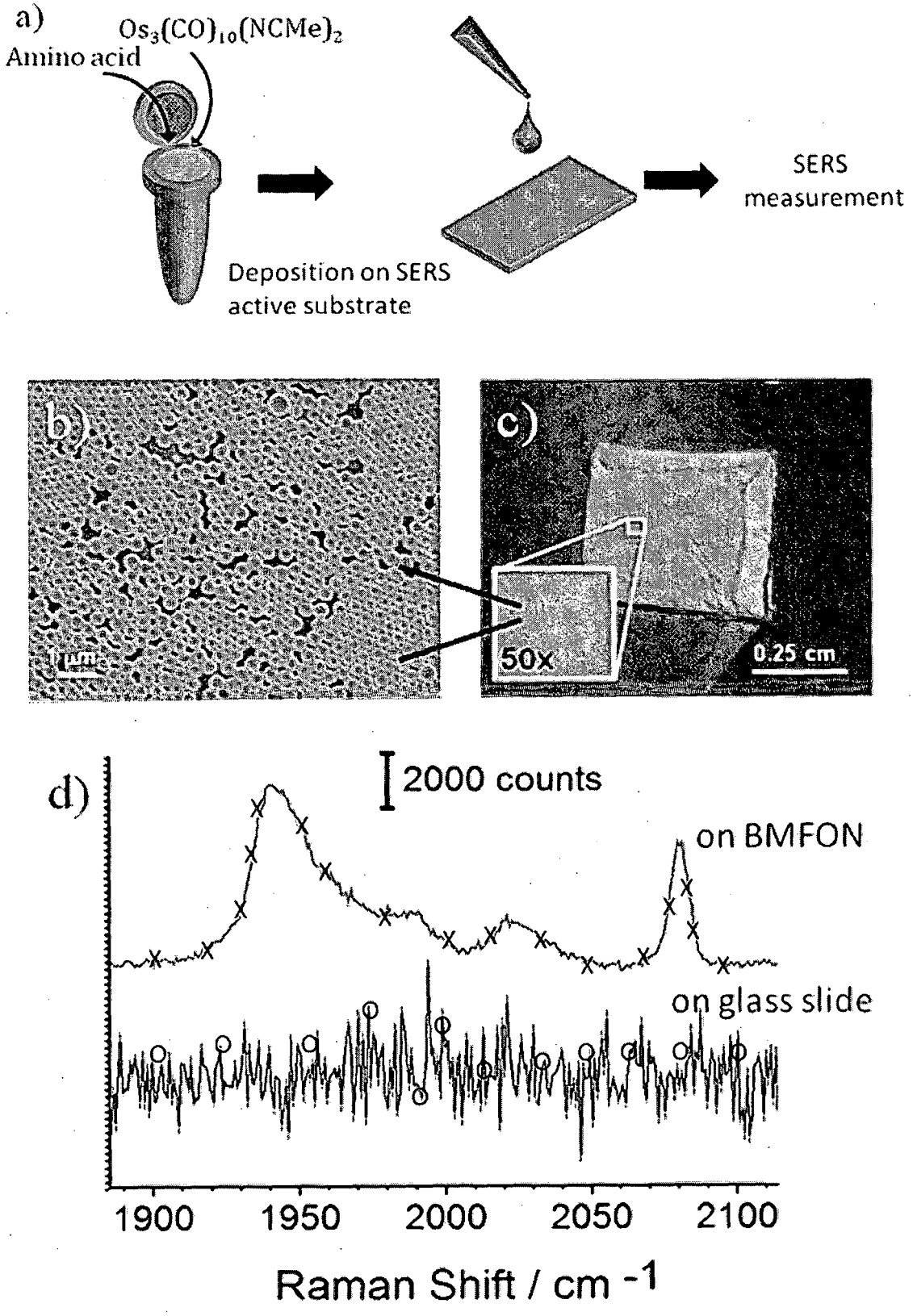

a)
$Os_3(CO)_{10}(NCMe)_2$
Amino acid
Deposition on SERS active substrate
SERS measurement
b)
1μm
c)
50x
0.25 cm
d)
2000 counts
on BMFON
on glass slide
1900
1950
2000
2050
2100
Raman Shift / cm -1

FIG. 2

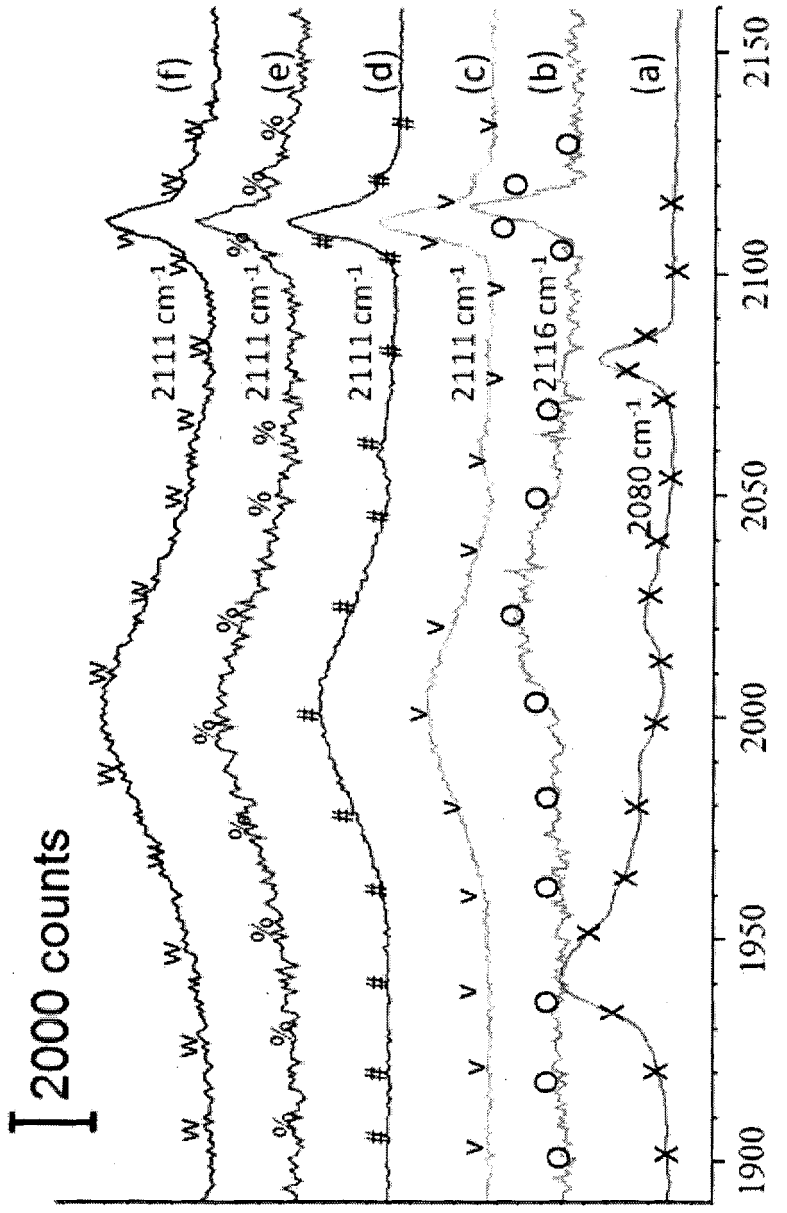

2000 counts
2111 cm-1
2111 cm-1
2111 cm-1
2111 cm-1
2116 cm-1
2080 cm-1
(f)
(e)
(d)
(c)
(b)
(a)
1900
1950
2000
2050
2100
2150
Raman shift / cm -1

FIG. 3

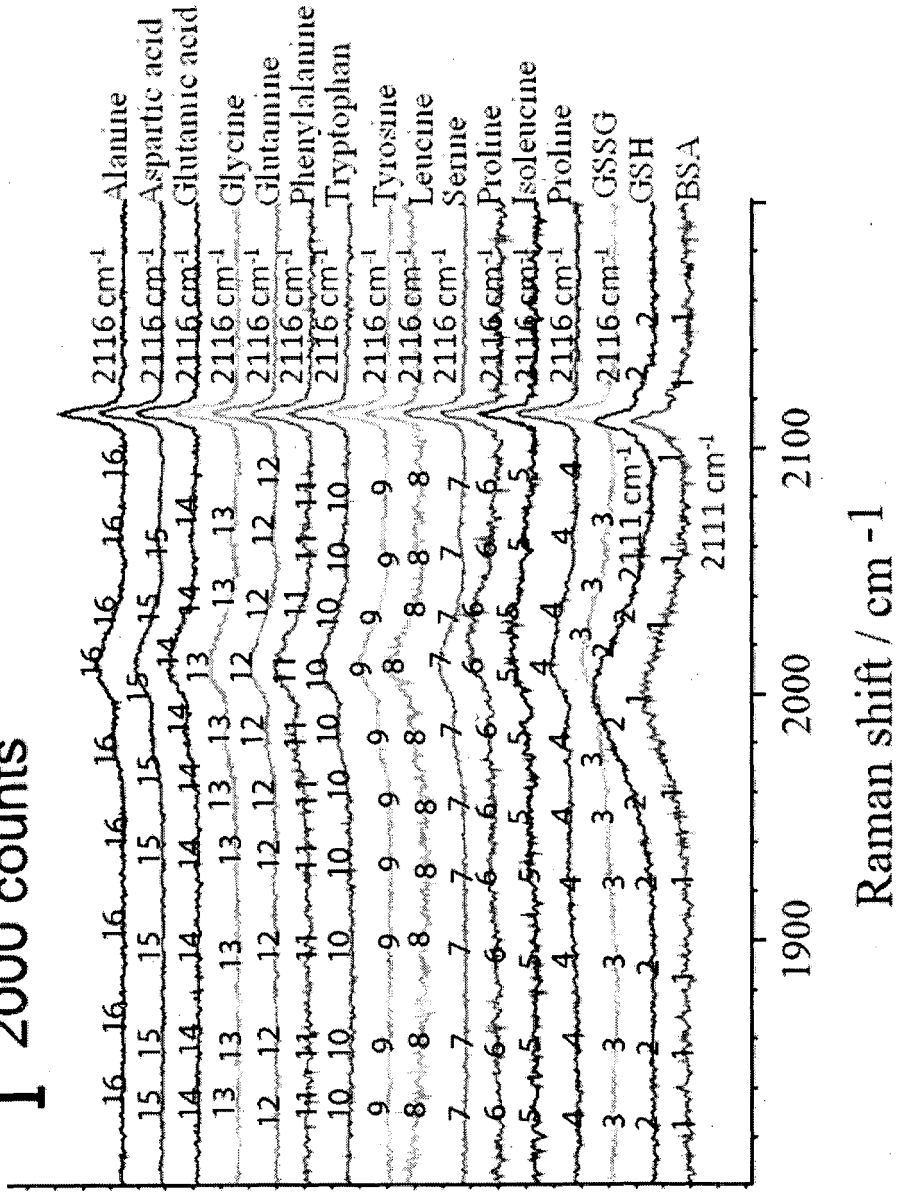

2000 counts
2116 cm-1
Alanine
Aspartic acid
Glutamic acid
Glycine
Glutamine
Phenylalanine
Tryptophan
Tyrosine
Leucine
Serine
Proline
Isoleucine
Proline
GSSG
GSH
BSA
2111 cm-1
1900
2000
2100
Raman shift / cm -1

FIG. 4

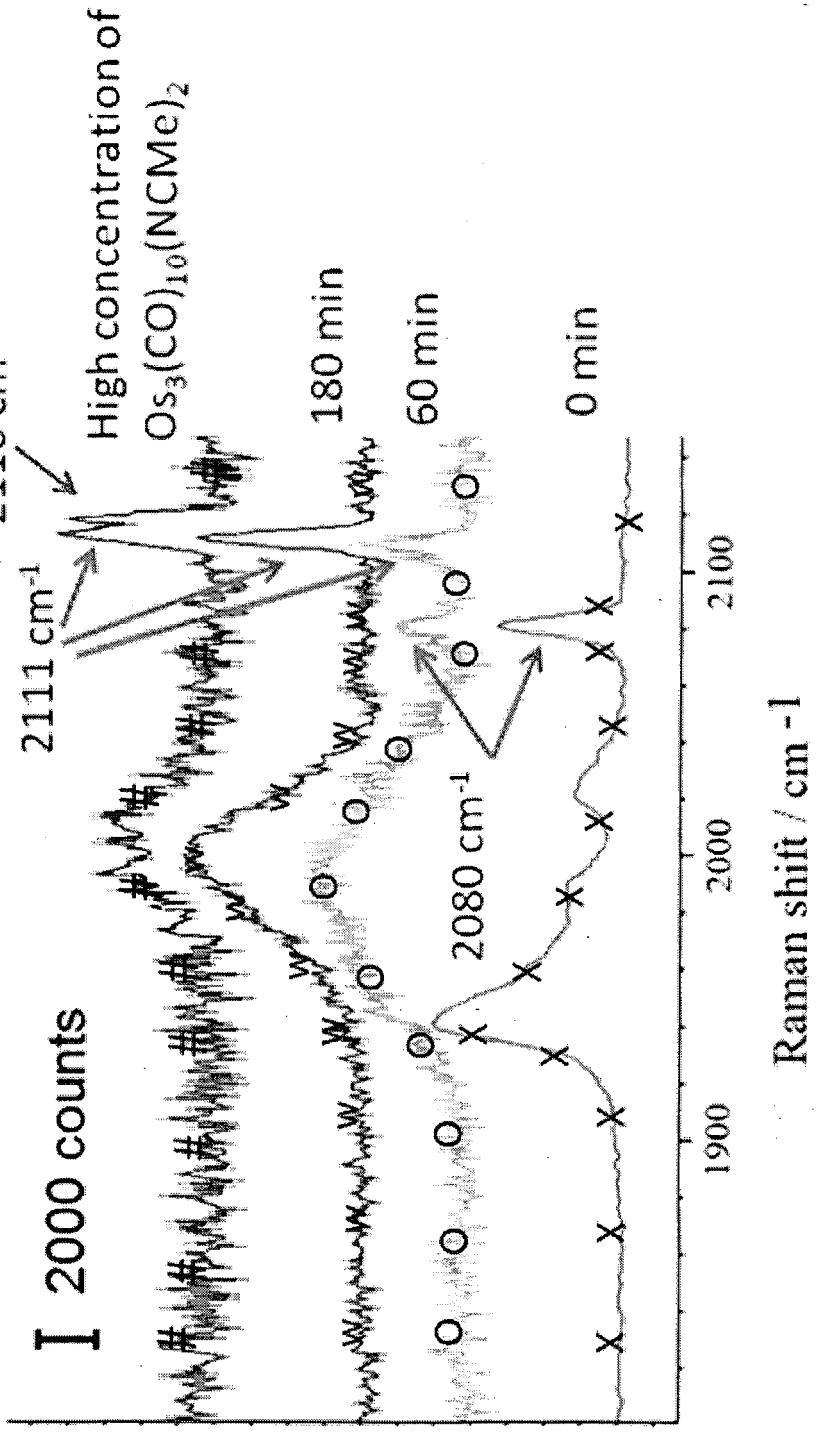

2116 cm-1
High concentration of
Os3(CO)10(NCMe)2
2111 cm-1
180 min
60 min
0 min
2080 cm-1
2000 counts
1900
2000
2100
Raman shift / cm -1

FIG. 5

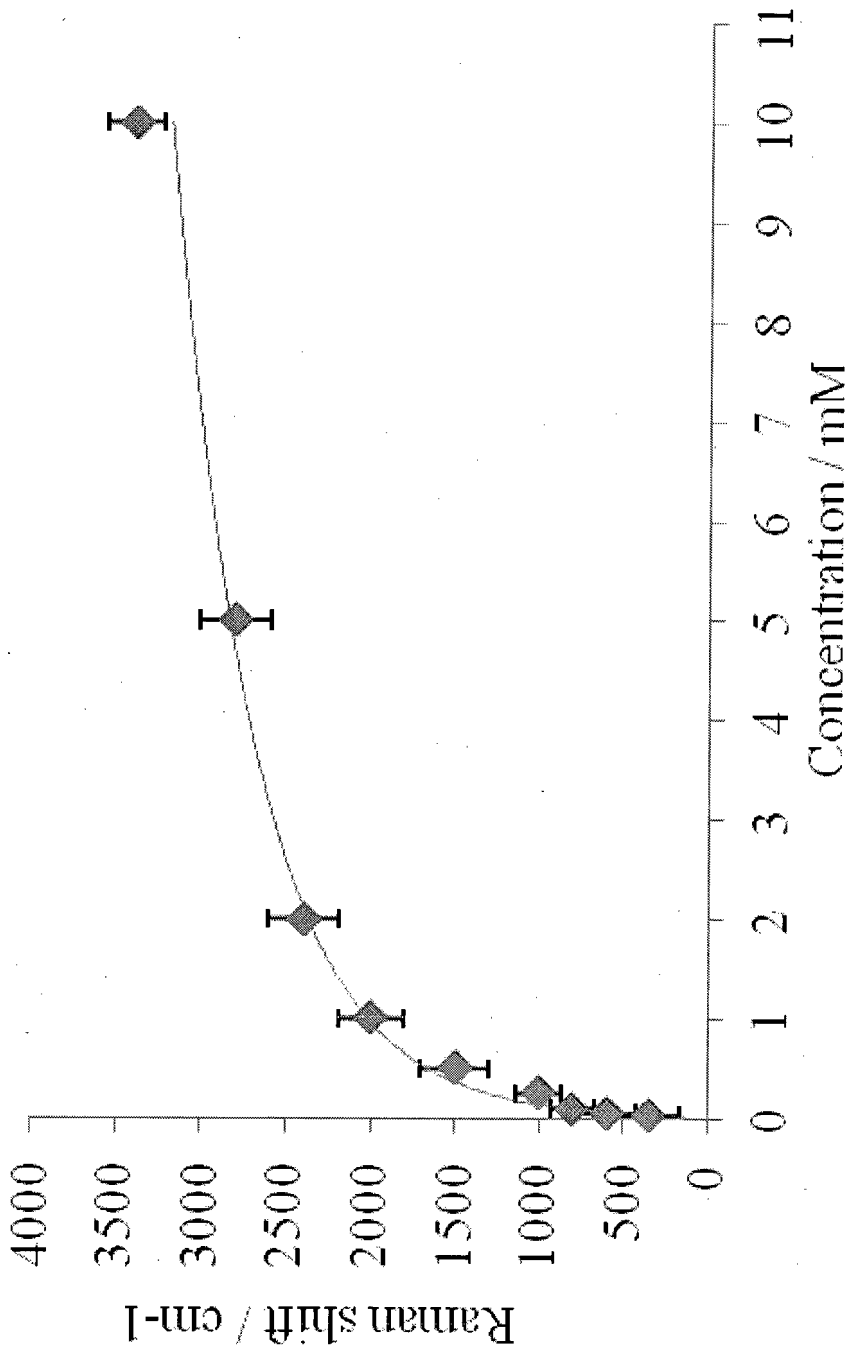

Raman shift / cm-1
4000
3500
3000
2500
2000
1500
1000
500
0
0 1 2 3 4 5 6 7 8 9 10 11
Concentration / mM

FIG. 6

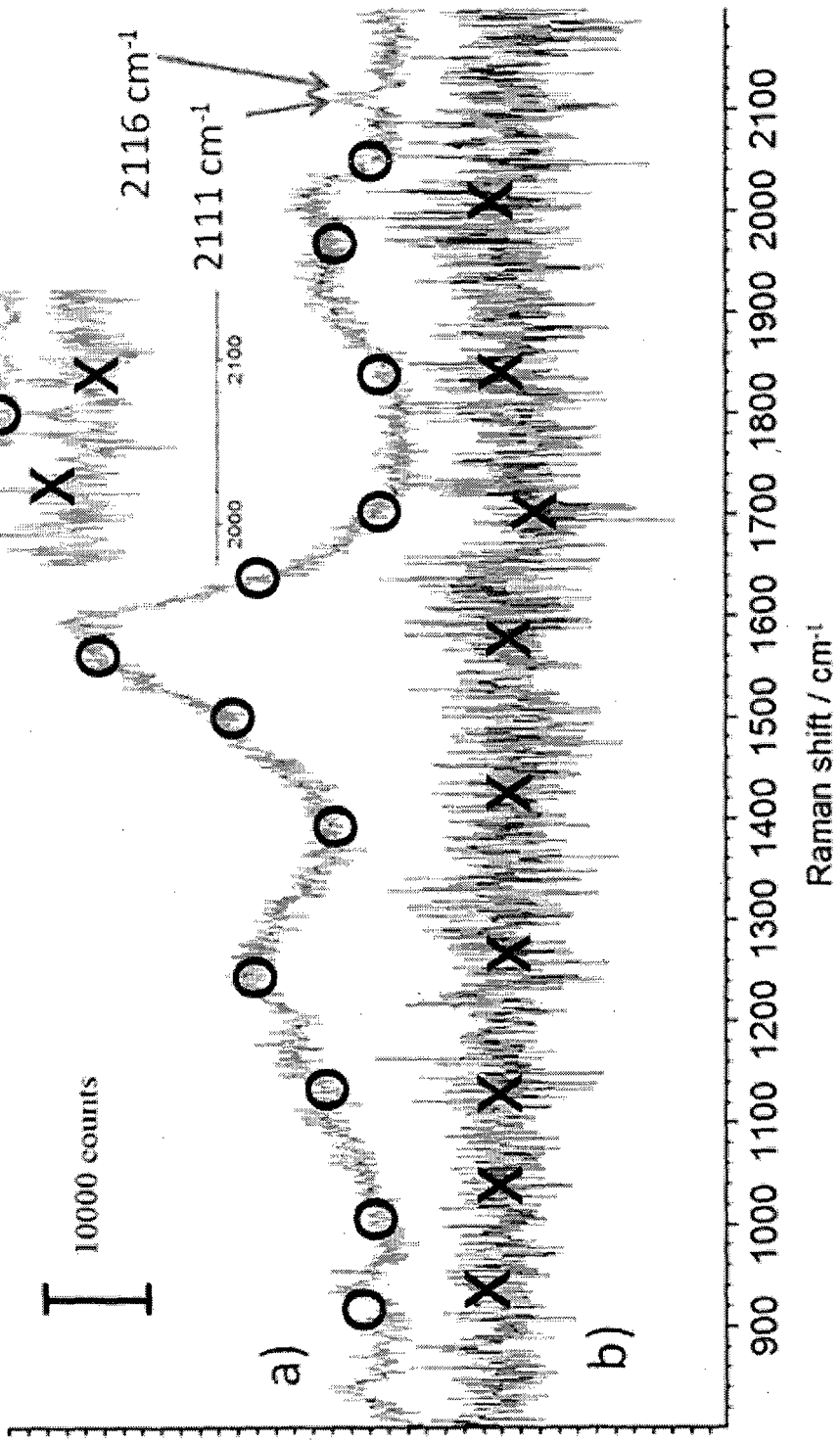
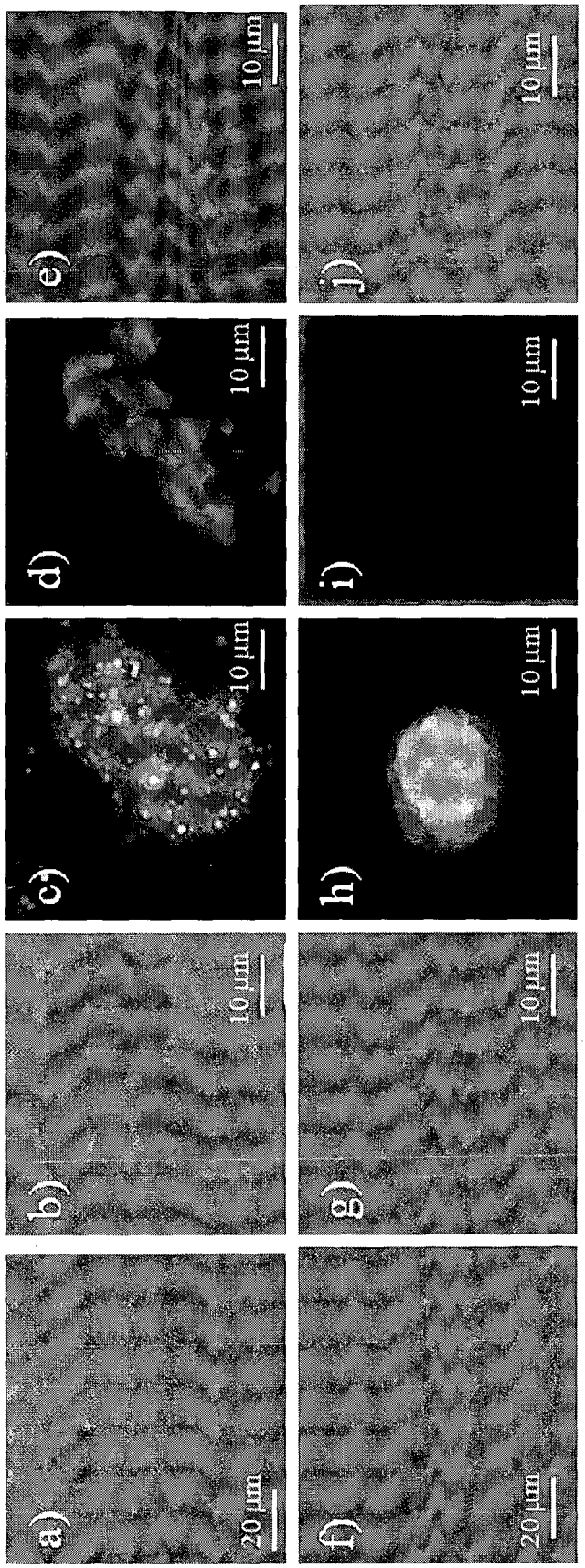

2116 cm-1
2111 cm-1
2100
2000
10000 counts
a)
b)
900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100
Raman shift / cm-1

FIG. 7


a)
20 µm
b)
10 µm
c)
10 µm
d)
10 µm
e)
10 µm
f)
20 µm
g)
10 µm
h)
10 µm
i)
10 µm
j)
10 µm

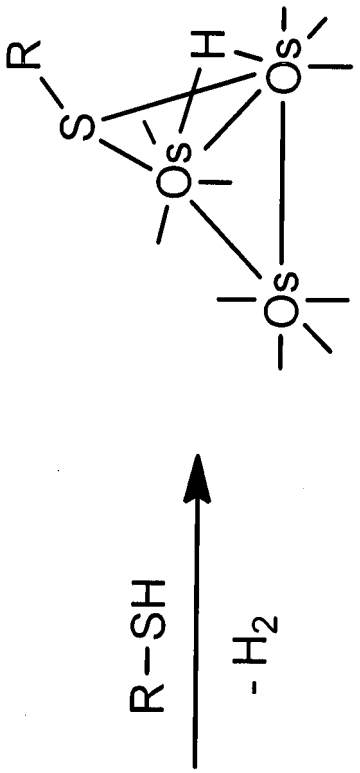


FIG. 8

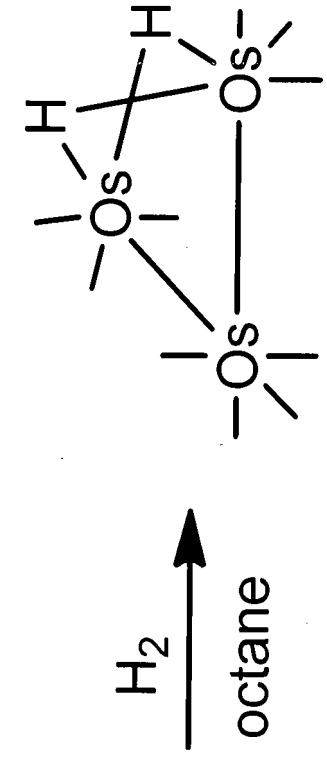


FIG. 9

FIG. 10

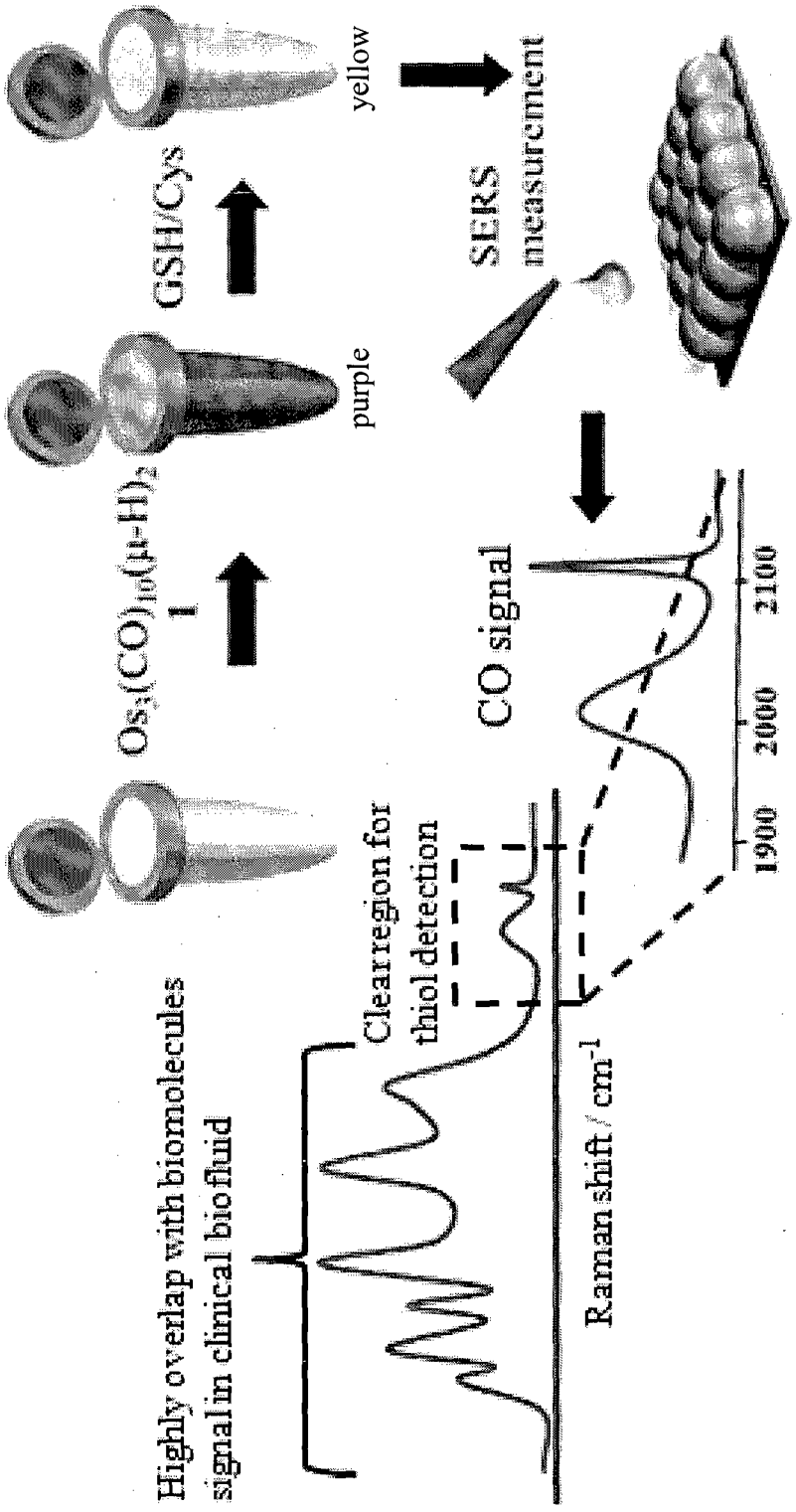

Os3(CO)10(μ-H)2
1
purple
GSH/Cys
yellow
SERS
measurement
Highly overlap with biomolecules
signal in clinical bio fluid
Clear region for
thiol detection
CO signal
Raman shift / cm-1
1900
2000
2100

FIG. 11

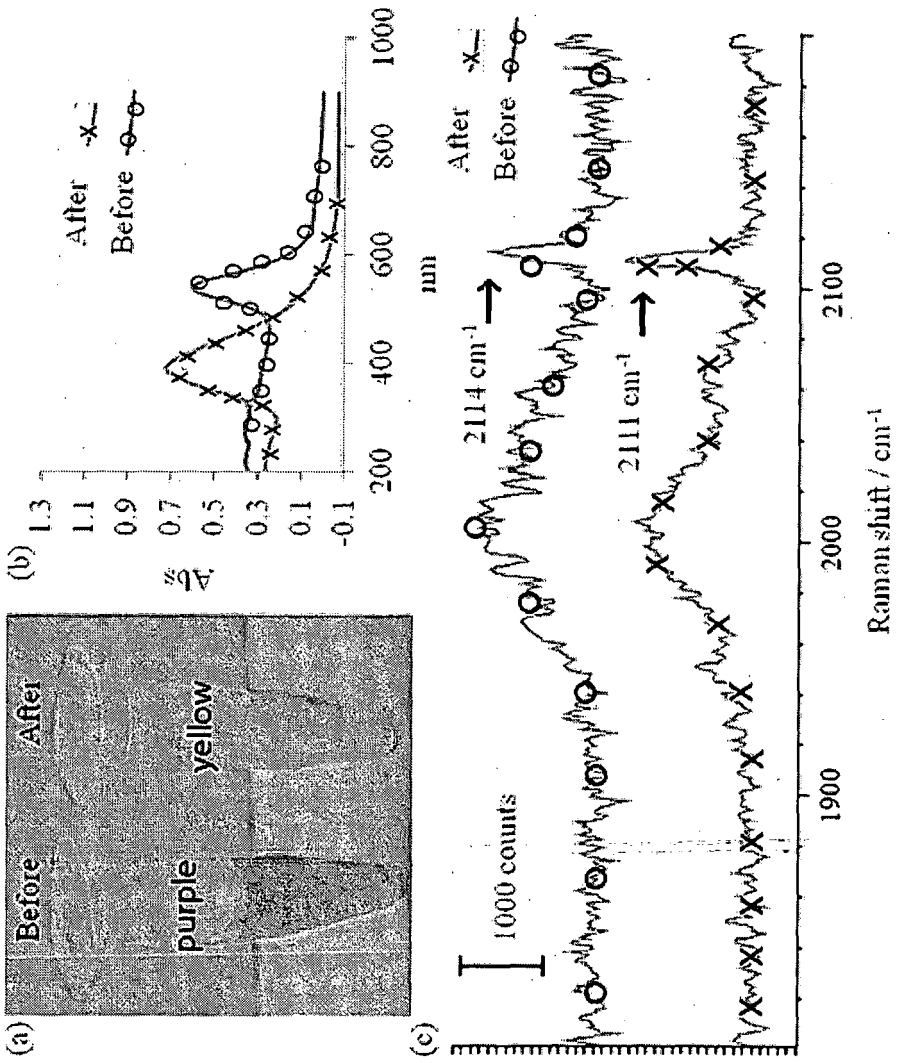
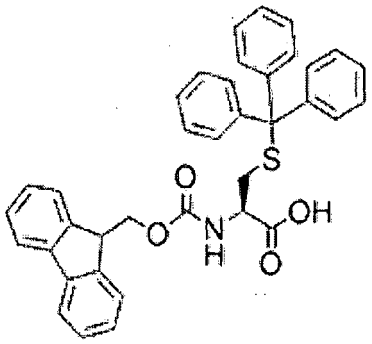
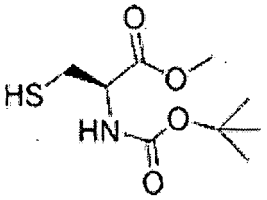

(a)
Before
After
purple
yellow
(b)
After
Before
nm
(c)
2114 cm-1
2111 cm-1
After
Before
1000 counts
Raman shift / cm-1

FIG. 12

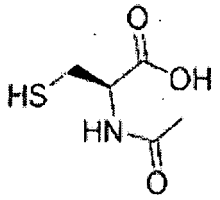
(a)



FMOC-S-trityl
-L-cysteine



N-(tert-butoxycarbonyl)
-L-cysteine methyl ester



N-acetyl-L-cysteine

(b)

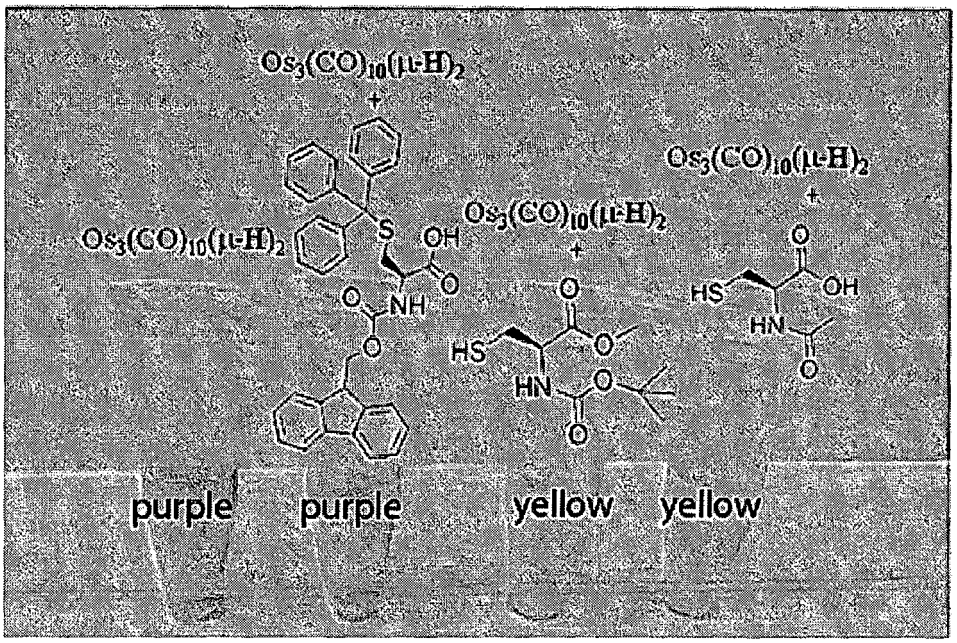


FIG. 12 (Cont.)

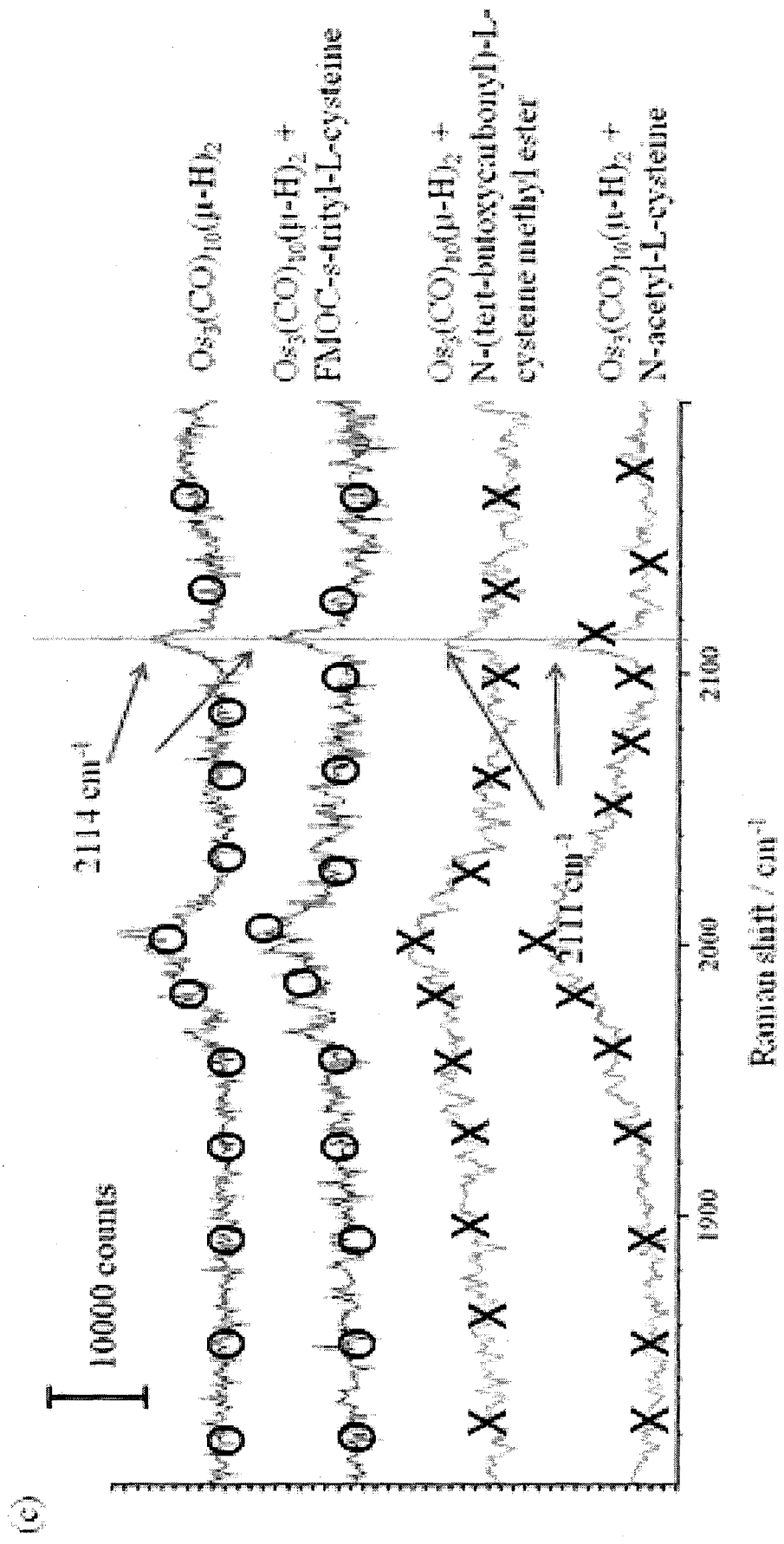

(c)
10000 counts
2114 cm-1
2111 cm-1
Os3(CO)10(μ-H)2
Os3(CO)10(μ-H)2 + FMOC-s-trityl-L-cysteine
Os3(CO)10(μ-H)2 + N-(tert-butoxycarbonyl)-L-cysteine methyl ester
Os3(CO)10(μ-H)2 + N-acetyl-L-cysteine
1900
2000
2100
Raman shift / cm-1

FIG. 12 (Cont.)

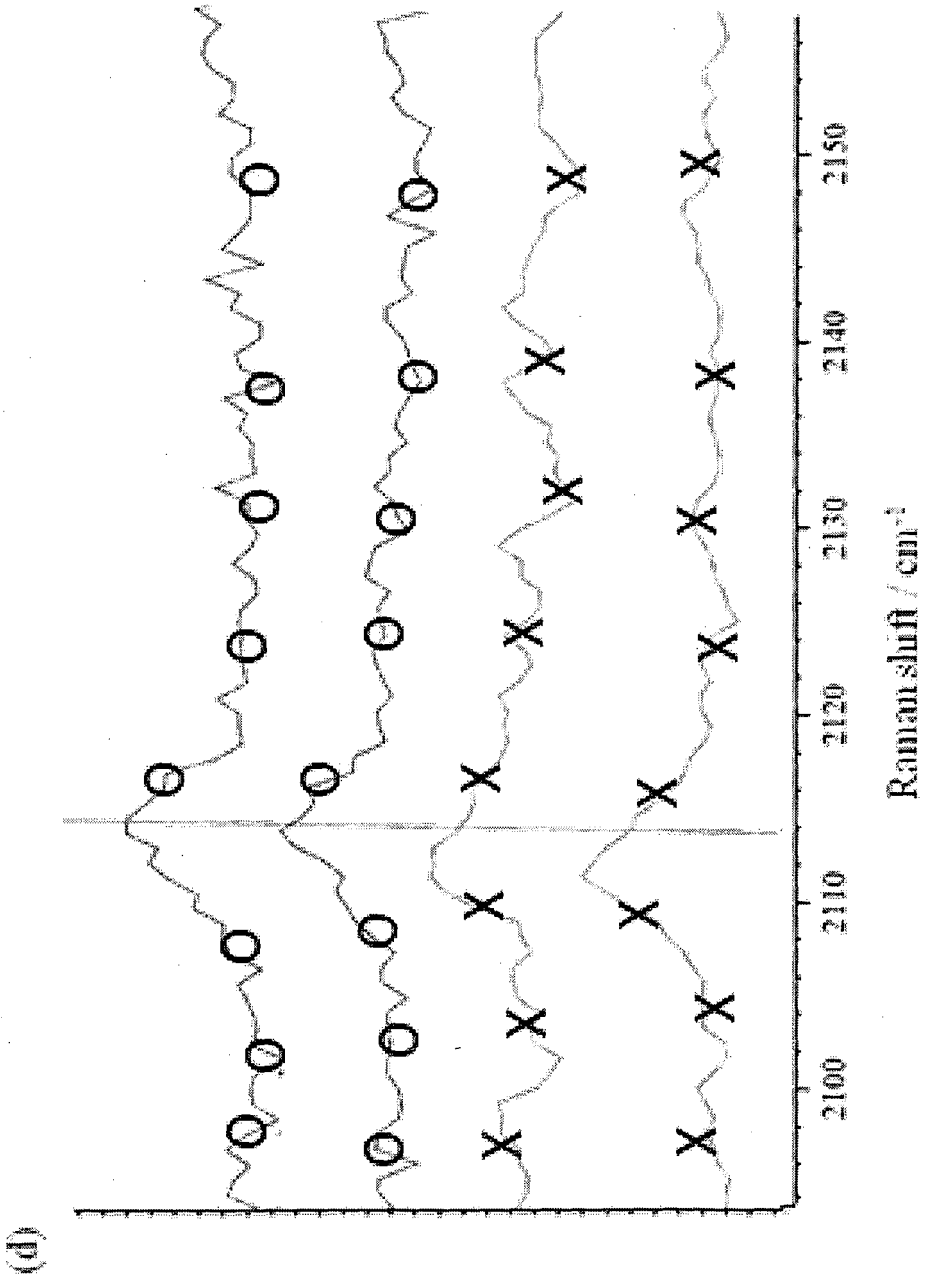


FIG. 13

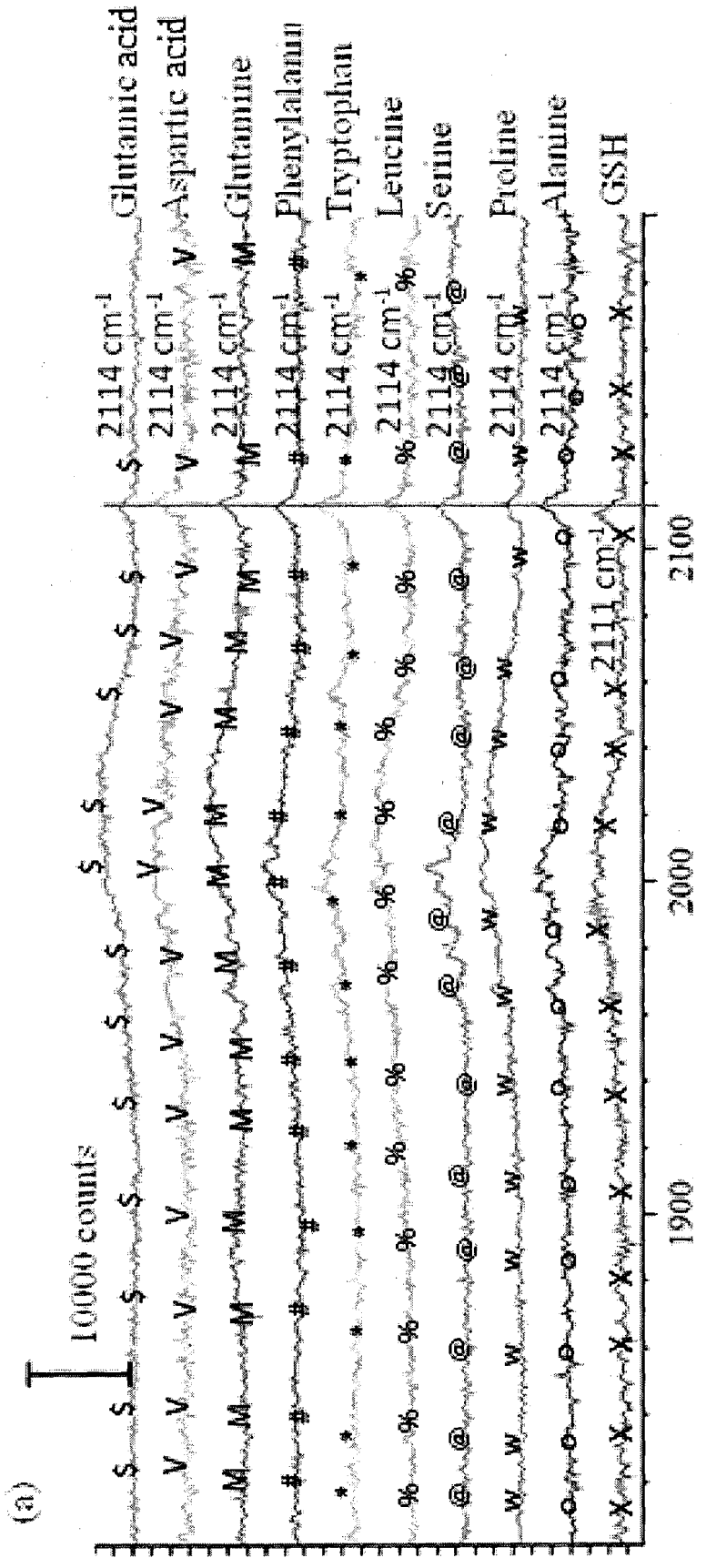

(a)
10000 counts
2114 cm-1
Glutamic acid
2114 cm-1
Aspartic acid
2114 cm-1
Glutamine
2114 cm-1
Phenylalanin
2114 cm-1
Tryptophan
2114 cm-1
Leucine
2114 cm-1
Serine
2114 cm-1
Proline
2114 cm-1
Alanine
2111 cm-1
GSH
1900
2000
2100
Raman shift / cm-1

FIG. 13 (Cont.)

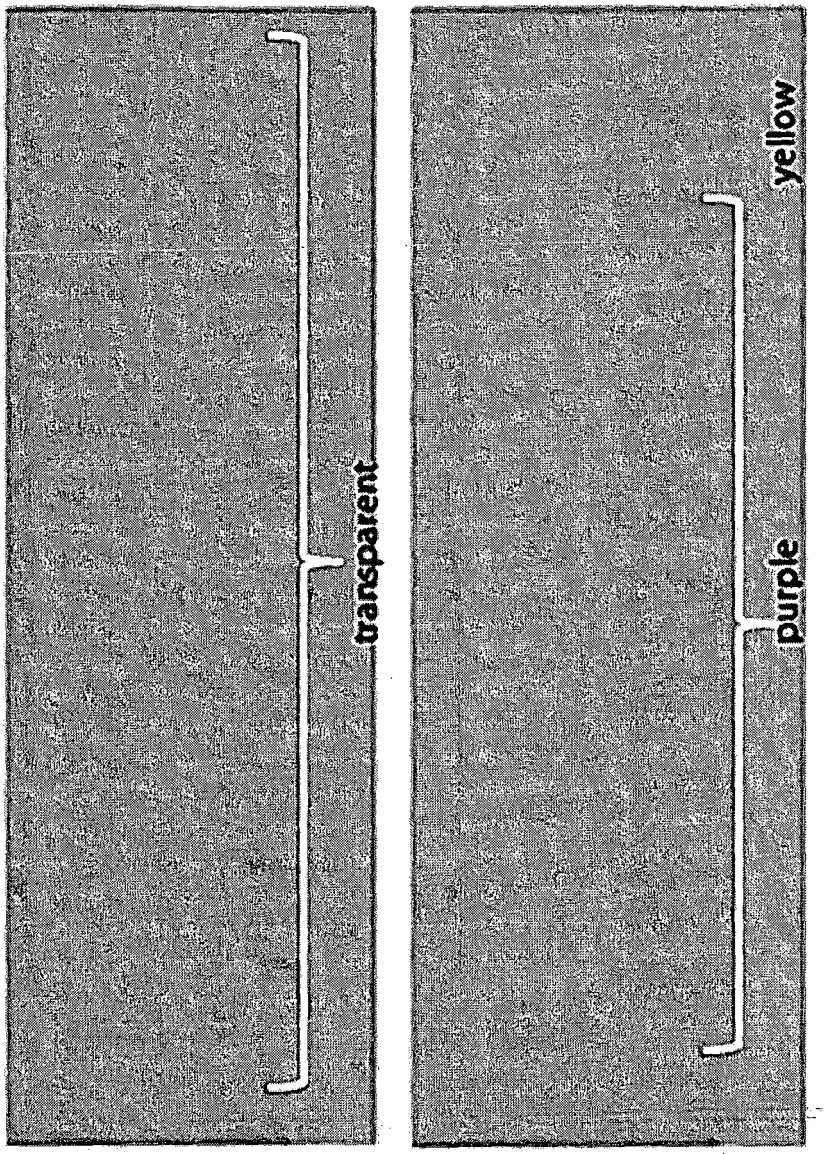
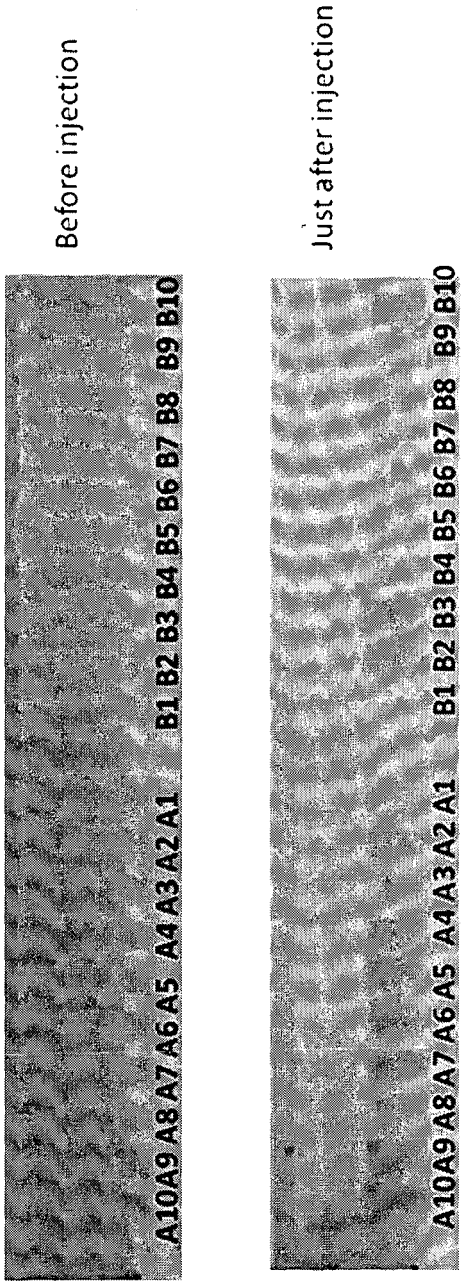

(b)
Glu Asp Glu Phe Trp Leu Ser Pro Ala GSH
Before adding
Os3(CO)10(μ-H)2
transparent
After adding
Os3(CO)10(μ-H)2
purple
yellow

FIG. 14



A10 = Alanine
A9 = Arginine
A8 = Aspartic acid
A7 = Asparagine
A6 = Glutamine
A5 = Glutamic acid
A4 = Glycine
A3 = Isoleucine
A2 = Phenylalanine
A1 = GSH

B10 = Tryptophan
B9 = Tyrosine
B8 = Valine
B7 = Lysine
B6 = Histidine
B5 = Leucine
B4 = Serine
B3 = Proline
B2 = Threonine
B1 = Cysteine

FIG. 15

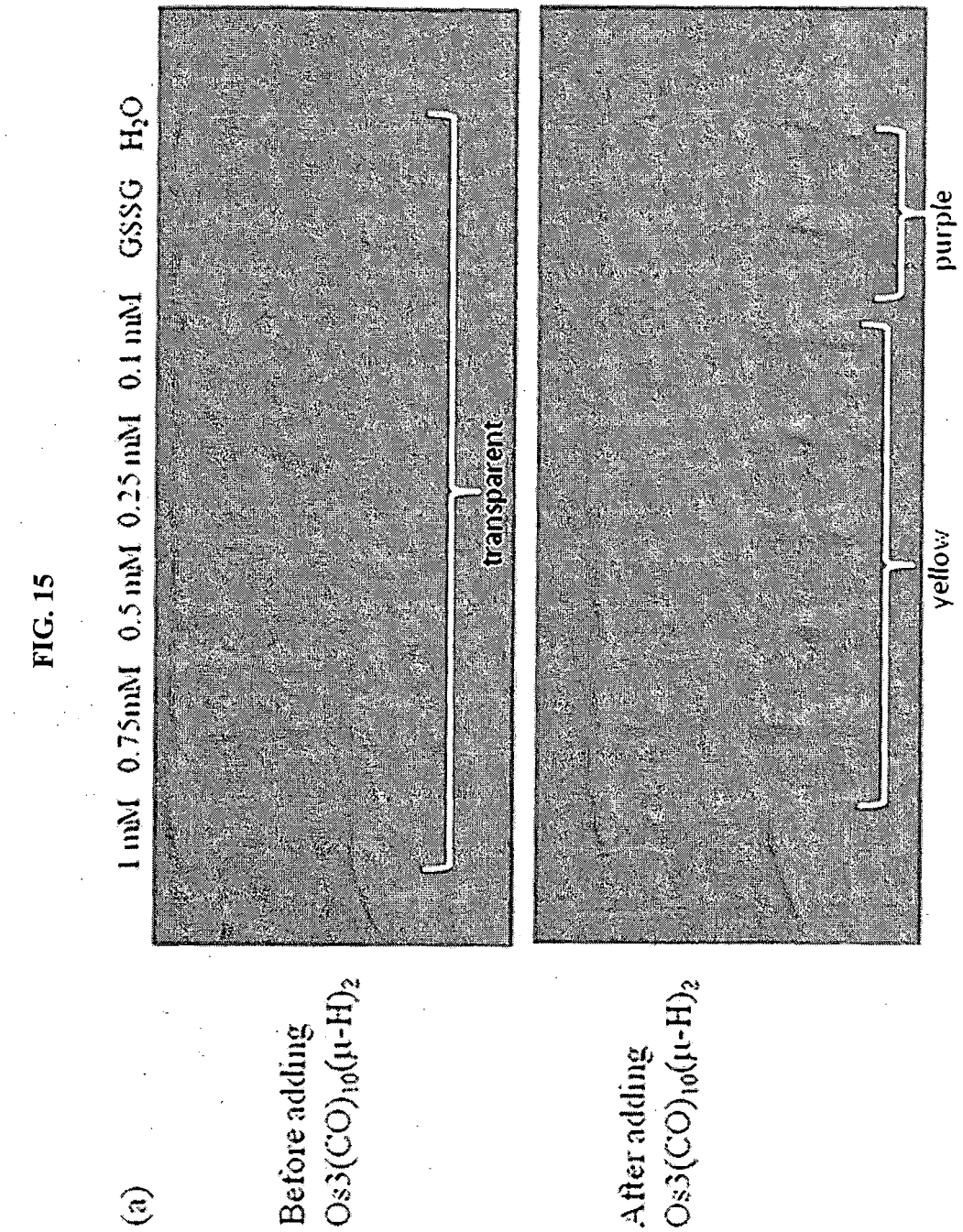

(a)
1 mM 0.75mM 0.5 mM 0.25 mM 0.1 mM GSSG H_2O
Before adding $Os3(CO)_{10}(\mu\text{-}H)_2$
transparent
After adding $Os3(CO)_{10}(\mu\text{-}H)_2$
yellow
purple

FIG. 15 (Cont.)

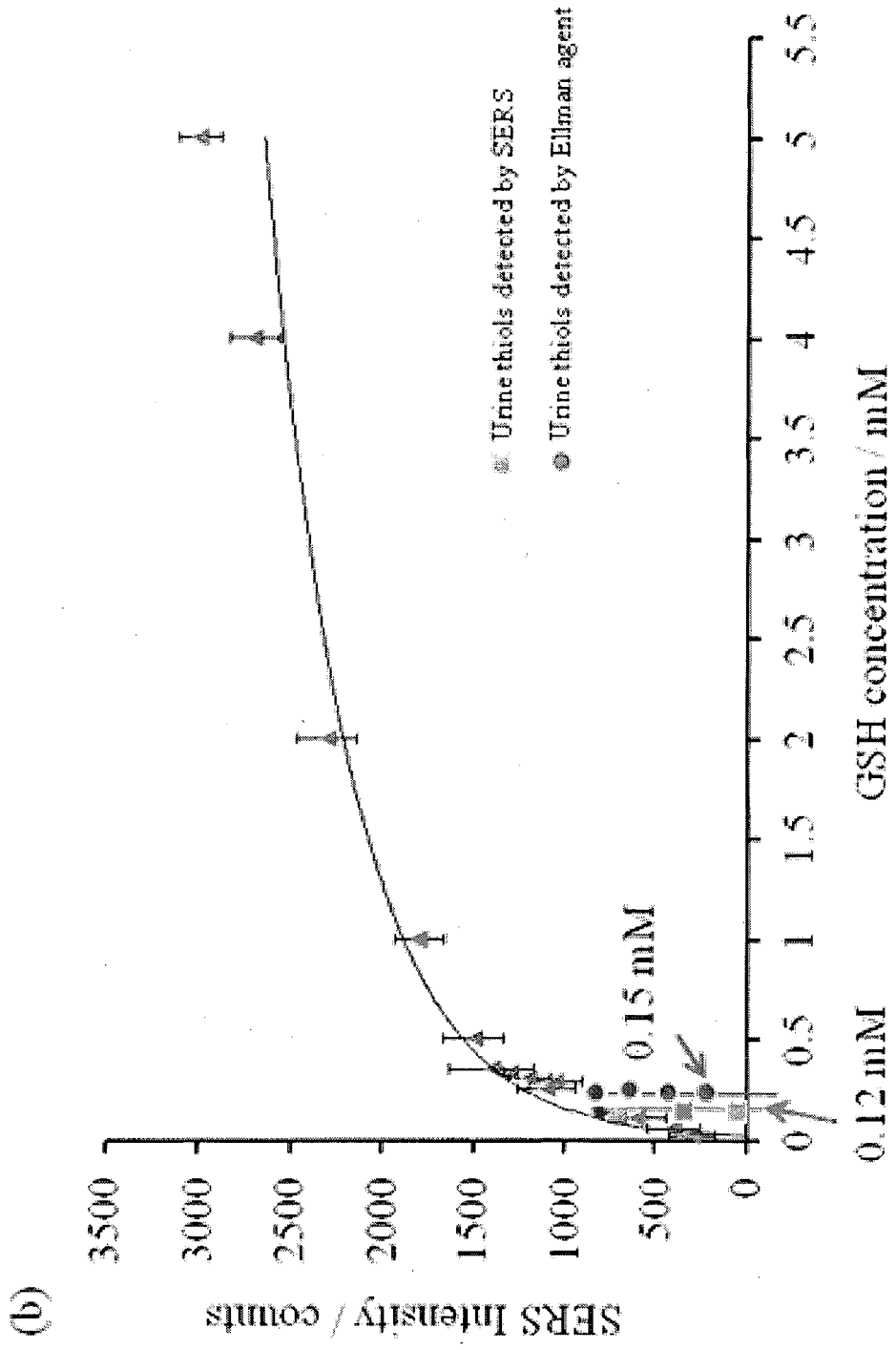
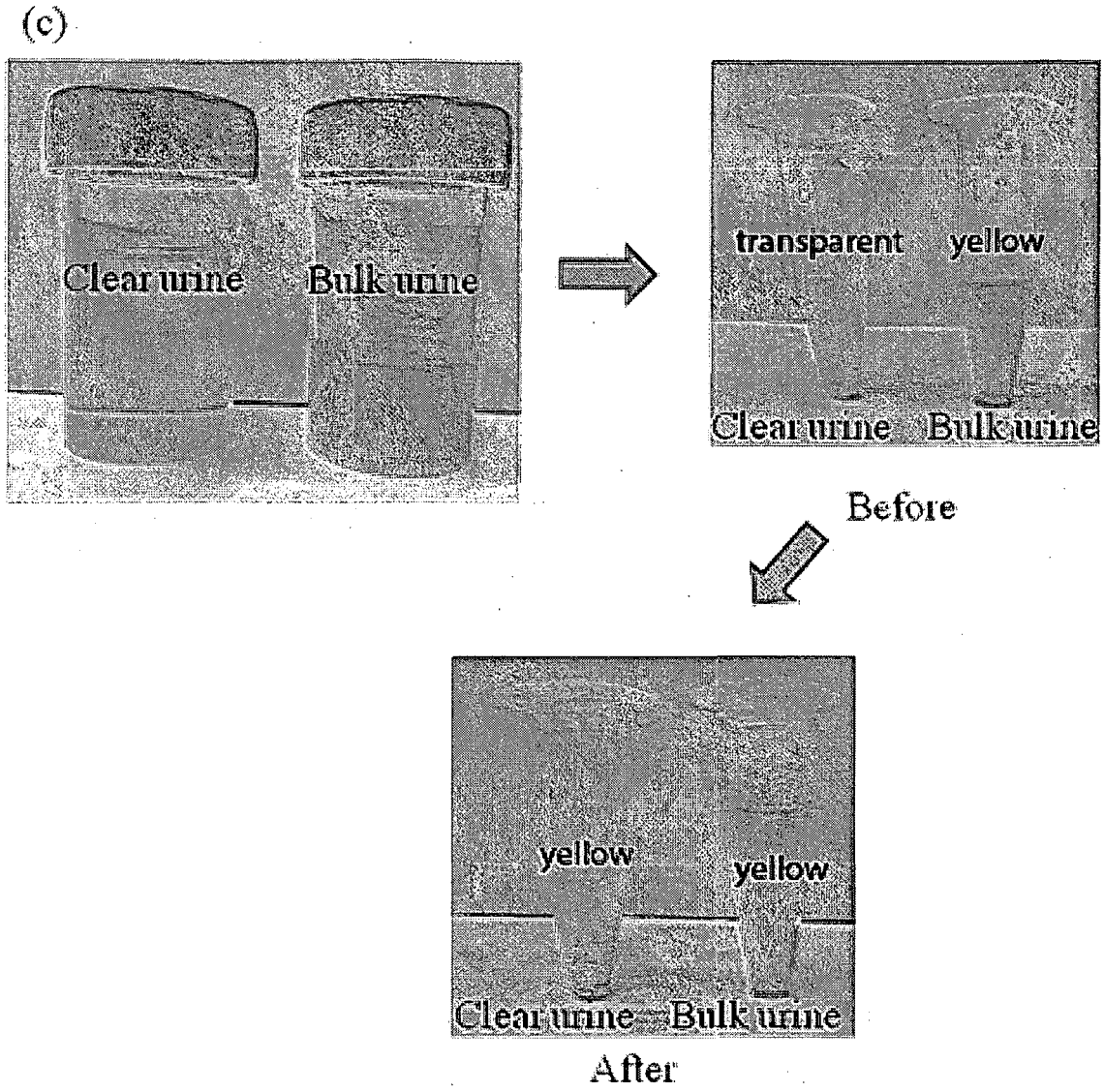

(b)
SERS Intensity / counts
3500
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
GSH concentration / mM
0.12 mM
0.15 mM
Urine thiols detected by SERS
Urine thiols detected by Ellman agent

FIG. 15 (Cont.)


(c)
Clear urine
Bulk urine
transparent
yellow
Clear urine
Bulk urine
Before
yellow
yellow
Clear urine
Bulk urine
After

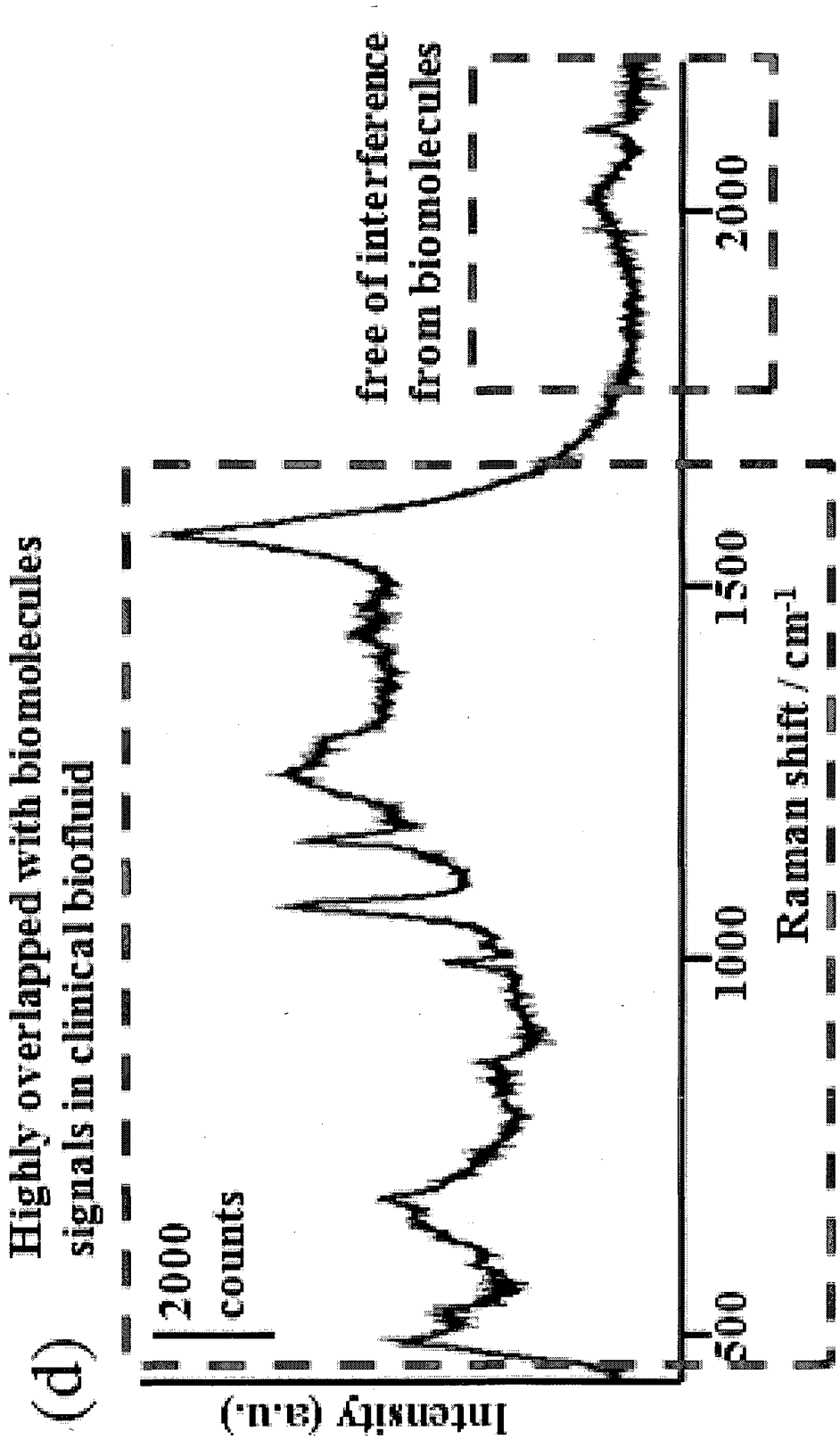

(d)
Highly overlapped with biomolecules signals in clinical biofluid
2000 counts
free of interference from biomolecules
Intensity (a.u.)
500
1000
1500
2000
Raman shift / cm-1

FIG. 15 (Cont.)