CLAIMS

1. A method of detecting one or more analytes comprising hydrogen peroxide using surface enhanced Raman spectroscopy (SERS), the method comprising
    a) providing a SERS-active substrate having at least one metal carbonyl cluster compound attached thereon;
    b) contacting the one or more analytes with the SERS-active substrate; and
    c) detecting changes in surface enhanced Raman signal from the at least one metal carbonyl cluster compound as an indication of the presence of the one or more analytes comprising hydrogen peroxide.

2. The method according to claim 1, wherein the at least one metal carbonyl cluster compound has general formula (I)

$$M_3(CO)_xL_{12-x} \qquad (I)$$

wherein

M at each occurrence denotes a metal selected from Group 6 to Group 11 of the Periodic Table of Elements;
x is an integer from 10 to 12;
and each L is independently selected from the group consisting of --H and $--S--(C_6H_4)_n-SH$, wherein n is an integer from 1 to 3.

3. The method according to claim 2, wherein M is independently selected from the group consisting of Fe, Ru, and Os.

4. The method according to claim 2, wherein M is Os.

5. The method according to claim 2, wherein x is 10.

6. The method according to claim 2, wherein n is 1 or 2.

7. The method according to claim 1, wherein the at least one metal carbonyl cluster compound is selected from the group consisting of $Os_3(CO)_{10}(\mu\text{-}H)_2$, $Os_3(CO)_{10}(\mu\text{-}H)(\mu\text{-}SC_6H_4\text{-}p\text{-}SH)$, $Os_3(CO)_{10}(\mu\text{-}H)(\mu\text{-}SC_6H_4\text{-}C_6H_4\text{-}p\text{-}SH)$, and combinations thereof.

8. The method according to claim 1, wherein the SERS-active substrate comprises gold nanoparticles.

9. The method according to claim 1, wherein the SERS-active substrate comprises gold nanoparticles having a mean diameter in the range of about 40 nm to about 100 nm.

10. The method according to claim 1, wherein contacting the one or more analytes with the SERS-active substrate is carried out in the presence of a suitable enzyme.

11. The method according to claim 10, wherein the one or more analytes comprising hydrogen peroxide are generated by reaction with the enzyme.

12. The method according to claim 11, wherein the one or more analytes comprising hydrogen peroxide generated by reaction with the enzyme are selected from the group consisting of glucose, uric acid, lactate, glutamate, and cholesterol.

13. The method according to claim 11, wherein the one or more analytes comprising hydrogen peroxide generated by reaction with the enzyme comprise glucose.

14. The method according to claim 13, wherein the enzyme comprises glucose oxidase.

15. The method according to claim 1, wherein the SERS-active substrate having at least one metal carbonyl cluster compound attached thereon is formed by providing at least one unbound metal carbonyl cluster compound, allowing the one or more analytes to react with

the at least one unbound metal carbonyl cluster compound, and attaching the resulting at least one metal carbonyl cluster compound to the SERS-active substrate.

16. The method according to claim 15, wherein the one or more analytes comprises a thiol group.

17. The method according to claim 1, wherein detecting changes in surface enhanced Raman signal from the at least one metal carbonyl cluster compound comprises at least one of (i) detecting changes in pattern and/or intensity of SERS signal in the region of 1800 cm^{-1} to 2200 cm^{-1}; and (ii) detecting peak shifts in surface enhanced Raman spectrum from the at least one metal carbonyl cluster compound as an indication of the presence of the one or more analytes.

18. The method according to claim 1, wherein the hydrogen peroxide is generated in one or more living cells.

19. The method according to claim 1, wherein the one or more analytes comprising hydrogen peroxide is detected in a body fluid comprising the one or more analytes.

20. The method according to claim 19, wherein the body fluid is selected from the group consisting of plasma, serum, blood, lymph, liquor and urine.