

Supporting Information

Ultrathin polydopamine film coated gold nanoparticles: A sensitive, uniform, and stable SHINERS substrate for detection of benzotriazole

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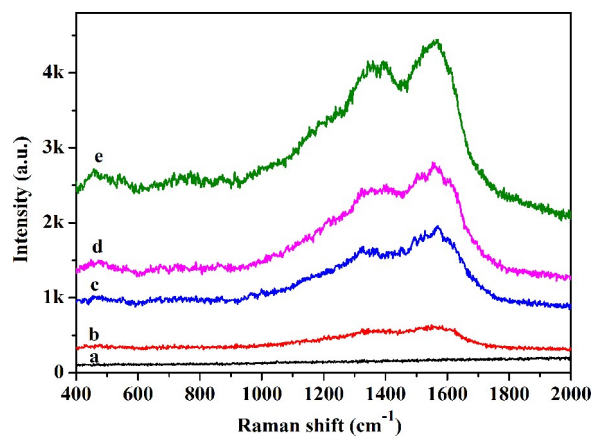


Fig. S1 Raman signals of Au@PDA substrate with different thickness: (a) uncoated, (b) 1.3 nm, (c) 2.3 nm, (d) 4.5 nm, and (e) 8.5 nm. The power was 0.15 mW and the integration time was 10 s.

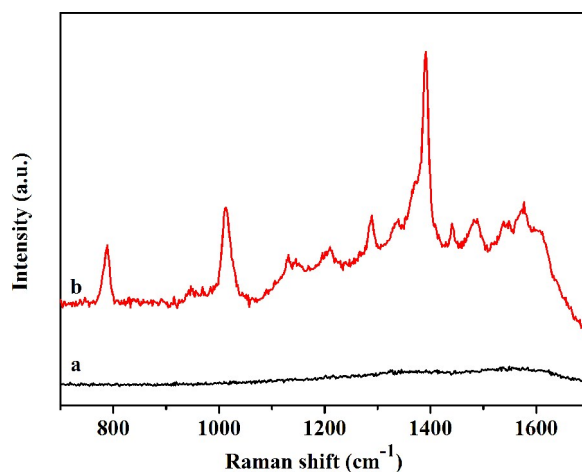


Fig. S2 Raman spectra from the Au@PDA substrate (a) and 10^{-6} M BTA adsorbed on the substrate (b) obtained under the same detection conditions (the power of 0.15 mW and the integration time of 10 s).

EF calculation

The enhancement factor of SERS can be calculated as the following formula ¹:

$$EF = \left(\frac{I_{SERS}}{I_{norm}} \right) \left(\frac{N_{bulk}}{N_{surf}} \right)$$

Here, I_{SERS} , I_{norm} , N_{bulk} , and N_{surf} are the measured SERS intensity for a monolayer of scatters, the measured intensity of nonenhanced or normal Raman scattering from a bulk sample, the number of molecules under laser illumination for the bulk sample, and the number of molecules in the SAM, respectively.

I_{SERS} and I_{norm} can be directly measured from the Raman spectra. For example, we can select the peak intensity of 1075 cm^{-1} as the identification position for 4-MBA. For the values of N_{bulk} and N_{surf} , they may be calculated on the basis of the estimate of the concentration of surface species or bulk sample and the corresponding sampling areas. Generally, assuming a molecular area of $0.22 \text{ nm}^2/\text{molecule}$ for a thiol footprint in the SAM, the surface concentration of the SAM on a SERS substrate equals to $7.6 \times 10^{-10} \text{ mol/cm}^2$. AS for a focused laser beam, its diameter and penetration depth of the laser spot are about 1 and $9 \text{ }\mu\text{m}$, respectively. Therefore, the N_{surf} value can be calculated to be $5.9 \times 10^{-18} \text{ mol}$. On the basis of the density of bulk 4-MBA ($\sim 1.22 \text{ g/cm}^3$), the N_{bulk} value can be calculated to be $3.2 \times 10^{-14} \text{ mol}$ for 4-MBA.

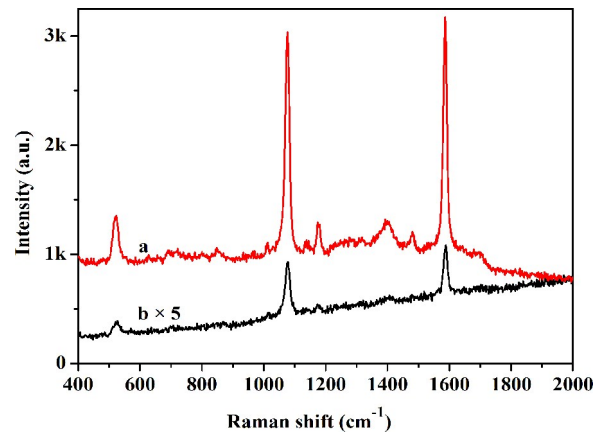


Fig. S3 (a) SERS spectrum of a monolayer of 4-MBA adsorbed on Au@PDA (1.3 nm). (b) Normal Raman spectrum of pure 4-MBA powder. The laser power is 15 μ W and the integration time is 10 s.

References

- 1 W.B. Cai, B. Ren, X. Q. Li, C. X. She, F. M. Liu, X. W. Cai and Z. Q. Tian, *Surf. Sci.* 1998, **406**, 9-22.