Supporting information

Detection of trace mercury ions in water with a bovine-serum-albumin-modified Au@SiNWAs surface-enhanced-Raman-scattering sensor

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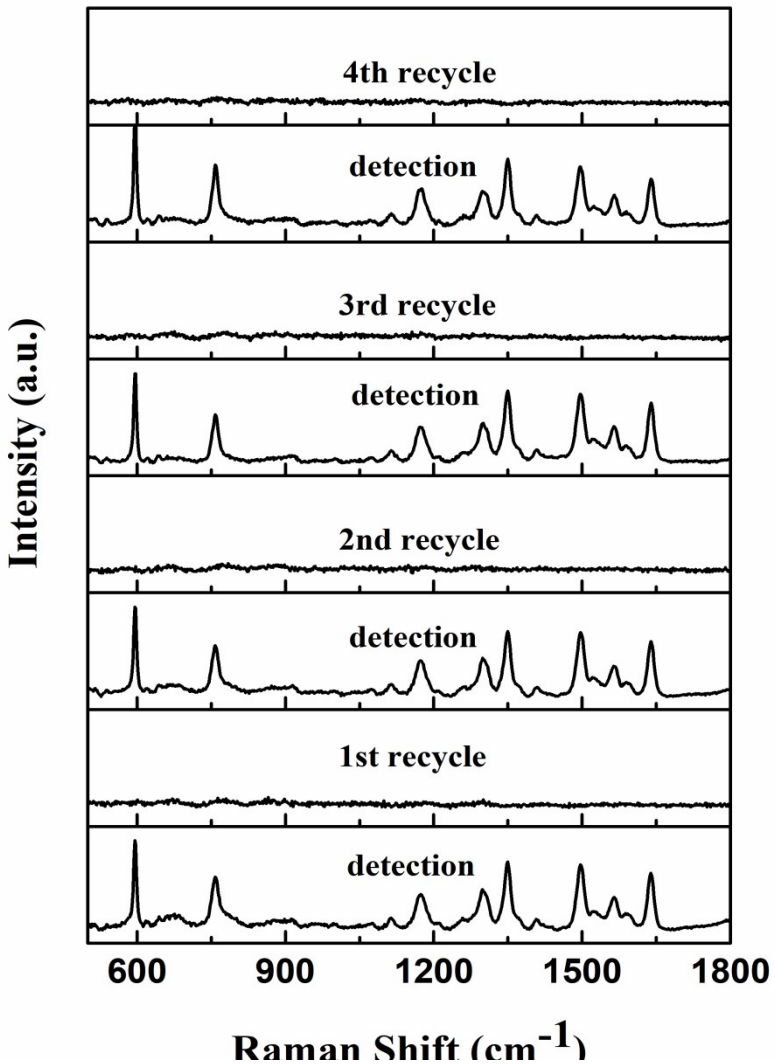

Figure S1. Raman test results of Au@SiNWAs and SiNWAs on 10^{-3} M R6G respectively.

The recyclability of the SERS substrate is demonstrated in Figure S1, which plots spectra from an initial SERS detection and after washing with 0.1M $NaBH_4$ aqueous solution several times. This data could be attributed to that hydrides derived from $NaBH_4$ have a higher binding affinity to Au NPs than the Au-S bond and thus replaces

them completely. Hence, the SERS analysis indicates that the Au@SiNWAs substrate has great recyclability.

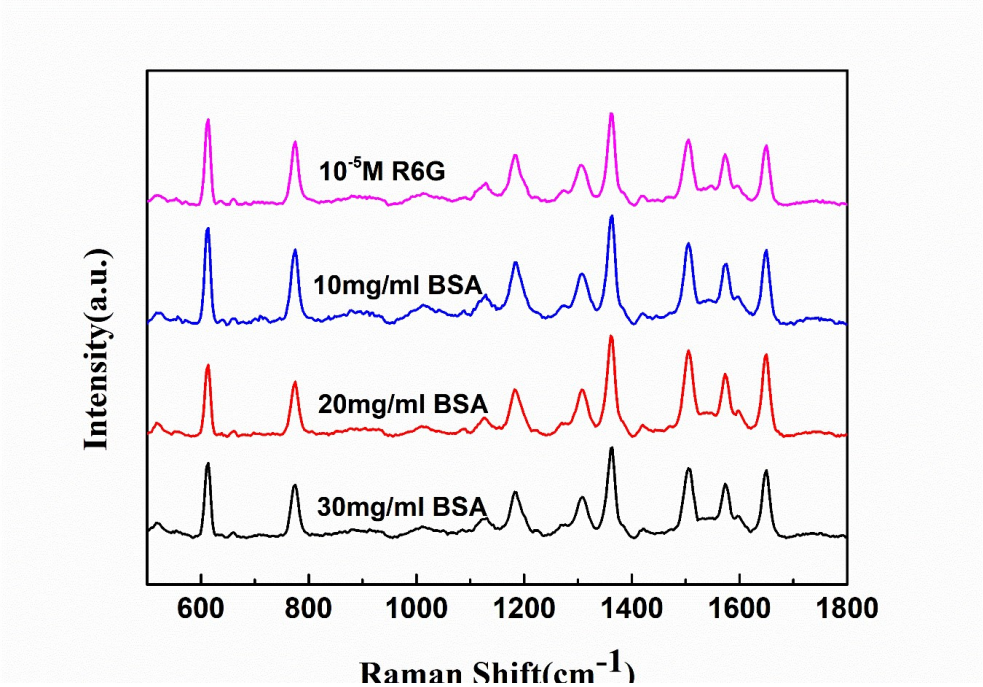

Figure S2. SERS signal of 10^{-5}M R6G, obtained from Au@SiNWAs modified with different concentrations of BSA

The substrate was respectively modified with 10, 20, and 30 mg/mL BSA to perform SERS test for 10^{-5} M R6G solution under the same conditions, and the results are shown in Figure S2. The concentration of BSA has no effect on the Raman signal of R6G, that is, it will not increase or decrease the intensity of the detected Raman peak.

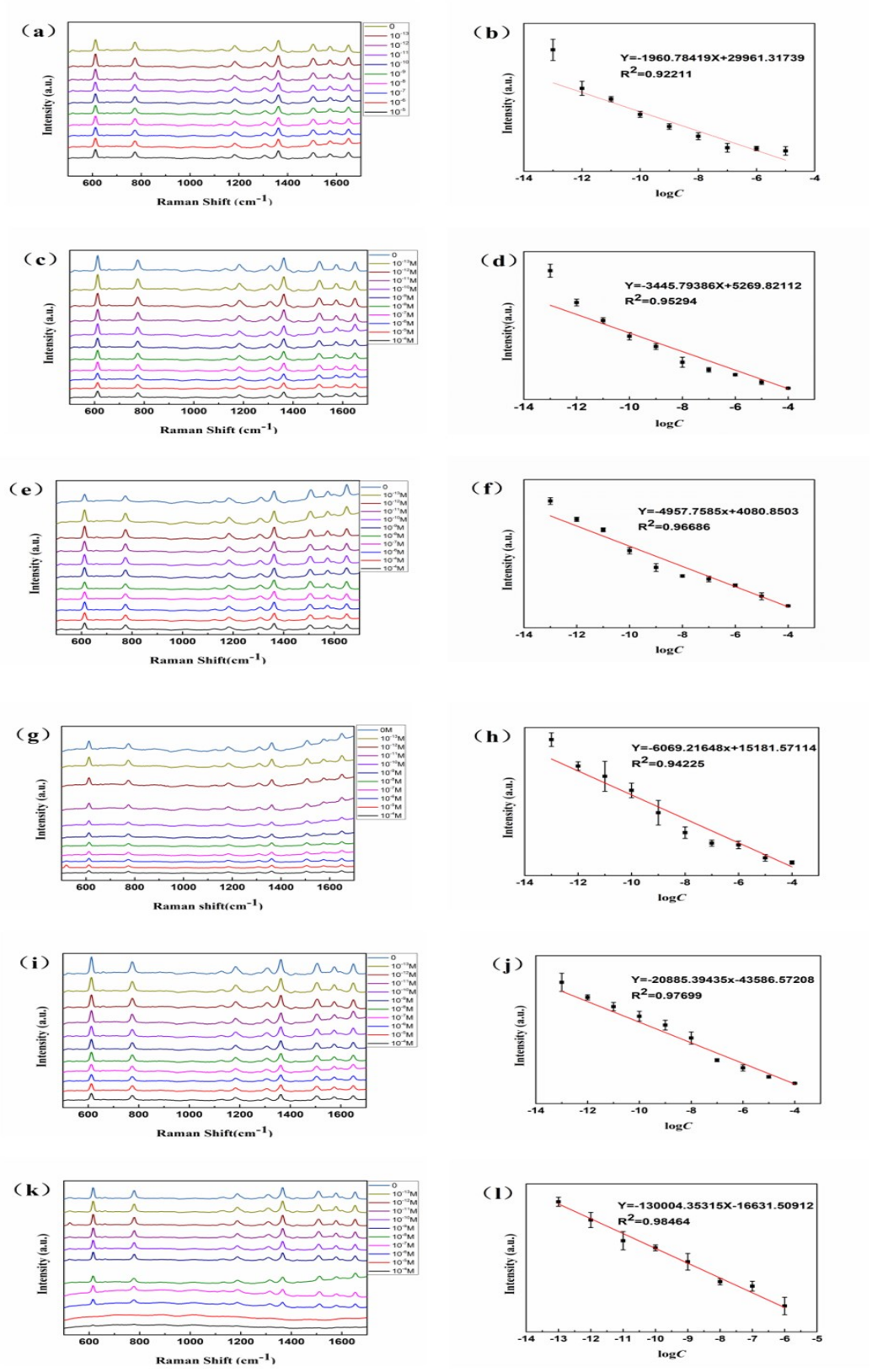

Figure S3.SERS results of Hg^{2+} ions detection; the Au@SiNWAs substrates are modified with six different concentrations of BSA. different concentrations of BSA

Table S1. Results of the Raman signal decrease when different concentrations of BSA are used for 10^{-12} M Hg^{2+} ions detection.

Concentration (mg/mL)	decrease of integrated intensity	decrease of peak height	R^2
5	12%	14%	92.211%
10	16%	25%	95.294%
20	14%	9%	96.686%
30	10%	16%	94.225%
50	8.6%	13%	97.699%
100	9%	11%	98.464%

Six different concentrations of BSA, 5, 10, 20, 30, 50, and 100 mg/mL, are used to observe the influence of BSA concentration on the SERS results of a series of concentration gradients of mercury ions. Figure S3 shows the results. At different concentration of BSA, the SERS intensity of R6G for Hg^{2+} ions detection is changed, but the Raman peak intensity at ~1361 cm^{-1} is linearly fitted to Hg^{2+} concentration. The decreasing trend of the integrated intensity and the height of the ~1361 cm^{-1} Raman peak are listed in Table S1. The most obvious decreasing trend occurs when the BSA concentration is 10 mg/mL, while the Raman signal still decreases significantly at the limit detection concentration of 10^{-12} M. Since the Raman signal intensity will change greatly at 10^{-12} M and 10^{-7} M, the R^2 obtained by linear fitting is for reference only. Therefore, in our experiments BSA with a concentration of 10 mg/mL is chosen for the detection of Hg^{2+} ions.