Electronic Supplementary Information

Target Induced Aggregation of Modified Au@Ag Nanoparticles for Surface Enhanced Raman Scattering and Its Ultrasensitive Detection of Arsenic (III) in Aqueous Solution

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Figure S1. All components of the biosensor used in this work. (A) Sequence of Ars-3 aptamer. (B) Chemical structure of poly(diallyldimethylammonium chloride). (C) Chemical structure of 4-mercaptopyridine. (D) Chemical structure of arsenite [As(III)] in aqueous solution.

Figure S2. The SEM images of the 4-MPY-modified Au@AgNPs solutions treated with different substances. (1): 4-MPY-modified Au@AgNPs; (2): 4-MPY-modified Au@AgNPs $+ 5.2 \times 10^{-7}$ g/mL PDDA; (3): 4-MPY-modified Au@AgNPs $+ 11.5$ nM aptamer; (4): 4-MPY-modified Au@AgNPs $+ 11.5$ nM aptamer $+ 5.2 \times 10^{-7}$ g/mL PDDA; (5): sample D+1 ppm As(III); (6): sample D+2 ppm As(III).
Figure S3. Effect of PDDA concentrations on the aggregation of Au@AgNPs. The absorption spectra of the Au@AgNPs solutions treated with increasing concentration of PDDA.

Figure S4. Effect of Ars-3 aptamer concentrations on the aggregation of Au@AgNPs. The concentration of PDDA was $5.2 \times 10^{-7}$ g/mL.
Figure S5. Effect of the concentration of 4-MPY of the sensing system on the Raman signal intensity in the presence of $5.2 \times 10^{-7}$ g/mL PDDA and 11.5 nM Ars-3 aptamer. (A) The Raman spectra of the 4-MPY-modified Au@AgNPs solutions treated with increasing concentration of 4-MPY. (B) the responding Raman signal intensity of the 4-MPY-modified Au@AgNPs solutions treated with increasing concentration of 4-MPY.

Figure S6. Effect of the time on the Raman signal intensity. (A) The Raman spectra of the 4-MPY-modified Au@AgNPs solutions treated with different concentration of As(III). (B) the responding Raman signal intensity of the 4-MPY-modified Au@AgNPs solutions against different time.
**Calculation of the detection limit.** According to the previous report,\(^1\)\(^2\) \(3\sigma/\text{slope}\) was used to determine the detection limit. The following is the detail on how to calculate the detection limit.

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<th>2</th>
<th>3</th>
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<th>5</th>
<th>6</th>
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<th>(\sigma)</th>
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<td>Raman Intensity</td>
<td>40.745</td>
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<td>40.005</td>
<td>40.404</td>
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The linear fitting equation at low As(III) concentrations was \(y=58.135+4.019 \times 16.367\times (R=0.998)\), so the slope is 16.367, thus \(3\sigma/\text{slope}\) is calculated as 59.

**References**
