Supporting Information

Sensitive and Multiplexed SERS Nanotags for the Detection of Cytokines Secreted by Lymphoma

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Figure S1. The histograms of diameter distribution analyzed from TEM images of AuNPs (a), Au@DTNB@AgNPs (b), Au@MBA@AgNPs (c), and Au@TFMBA@AgNPs (d) using Nano Measure software based on more than 100 nanoparticles.

Table S1. Mean diameters, PDIs and zeta potentials of AuNPs, Au@DTNB@AgNPs, Au@MBA@AgNPs, Au@TFMBA@AgNPs analyzed by dynamic light scattering (DLS).

<table>
<thead>
<tr>
<th>Nanoparticles</th>
<th>Size (nm)</th>
<th>PDI</th>
<th>Zeta potential (mV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AuNPs</td>
<td>44.47±7.86</td>
<td>0.507±0.009</td>
<td>-46.17±0.82</td>
</tr>
<tr>
<td>Au@DTNB@AgNPs</td>
<td>54.76±5.99</td>
<td>0.246±0.004</td>
<td>-32.93±1.24</td>
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<tr>
<td>Au@MBA@AgNPs</td>
<td>55.81±7.70</td>
<td>0.278±0.002</td>
<td>-40.93±0.94</td>
</tr>
<tr>
<td>Au@TFMBA@AgNPs</td>
<td>60.42±7.11</td>
<td>0.302±0.006</td>
<td>-32.59±1.15</td>
</tr>
</tbody>
</table>
**Figure S2.** Images of typical SEM (a), elemental distribution of Au (b), Ag (c), Au + Ag (d), and EDS (e) of Au@DTNB@AgNPs (A), Au@MBA@AgNPs (B) and Au@TFMBA@AgNPs (C). The scale bar of each SEM image is 1 μm.

**Figure S3.** UV-vis spectra of the AuNPs (black lines), AuNPs@Ra NPs (red lines) and Au@Ra@AgNPs. (blue lines). The gold nanoparticles modified by Raman (Ra) molecules of DTNB (a), MBA (b) and TFMBA (c) before and after silver coating were shown separately.
Figure S4. Raman intensity of the Raman reporters: DTNB (a), MBA (b), TFMBA (c) in Au@Ra (black lines) and Au@Ra@AgNPs (colored lines).
Figure S5. Stability study. (A) Comparison of Raman spectra of SERS nanotags for fresh-prepared (black lines) and those being stored at 4 °C for 6 months (coloured lines), which indicates that there are no measurable differences between the two measurements. (B) Photograph images of Au@Ra@Ag dispersed into H₂O (a), 0.9 % NaCl (b), PBS (c), DMEM (d), and DMEM containing 10% FBS (e), showing no obvious aggregation observed. This further confirms the stability of Au@Ra@Ag is stable at different media.