Electronic Supplementary Information

Graphene Oxide Embedded Sandwich Nanostructures for Enhanced Raman Readout and Their Applications in Pesticides Monitoring

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**Figure S1.** a) TEM image of the synthesized Au@Ag NPs. The scale bar is 10 nm. b) UV-Vis absorption spectra of the synthesized Au@Ag NPs, GO, Au NPs and Ag NPs dispersed in water. The inset is the photograph of the synthesized Au@Ag NPs (1), GO (2), Au NPs (3) and Ag NPs (4) dispersed in water.

**Figure S2.** Enlarged SEM image of GO coated Au@Ag NPs film.
**Figure S3.** a) Raman signals of GO on the PEI modified Au@Ag NPs film collected from 10 random spots. b) Raman signals of GO on the non-PEI modified Au@Ag NPs film collected from 10 random spots.

**Figure S4.** The typical AFM images of a) assembled Au@Ag NPs film, b) GO coated Au@Ag NPs film.
Table S1. Measured Average Zeta-Potential of GO and Au@Ag NPs.

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<th>GO</th>
<th>Au@Ag NPs</th>
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<tr>
<td>Zeta-Potential (mV)</td>
<td>-35.2</td>
<td>-53.4</td>
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Figure S5. a) SERS spectra of different concentrations of R6G dispersed on the prepared substrate. b) SERS spectra recorded from 15 random spots for $10^{-7}$ M R6G on the substrate.
Figure S6. SEM images of a) assembled Au NPs/GO/Au NPs and b) Ag NPs/GO/Ag NPs sandwich structure. (c) SERS spectra of $10^{-7}$ M R6G in ethanol on Au NPs/GO/Au NPs (curve 1), Ag NPs/GO/Ag NPs (curve 2), and Au@Ag NPs/GO/Au@Ag NPs (curve 3).

Figure S7. Raman spectra of 0.1 and $1 \times 10^{-9}$ M rhodamine-6G (R6G) on a silicon substrate (upper) and on the Au@Ag NPs/GO/Au@Ag NPs film (bottom), respectively.
**Figure S8.** The chemical structures of the agricultural chemical compounds used for the selectivity study.

**Figure S9.** SERS spectra of thiram in ultrapure water a), real lake water b) at different spiked concentrations, respectively.