Graphene Oxide Wrapped Individual Silver Nanocomposites with Improved Stability for Surface-enhanced Raman Scattering

Nan Gao, Ting Yang, Tao Liu, Yu Zou and Jiang Jiang*

CAS Key Laboratory of Nano-Bio Interface, i-Lab and Division of Nanobiomedicine, Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences, Suzhou, China 215123

Supporting Information

Figure S1. TEM image of SiO$_2$@Ag seeds obtained without adding PVP as stabilizer.
**Figure S2.** Zeta potentials of SiO$_2$@Ag, SiO$_2$@Ag-PDDA, GO, and SiO$_2$@Ag@GO.

![Zeta potentials graph]

**Figure S3.** Raman spectrum of 4-ATP of 1M concentration on Si substrate. The excitation wavelength was 532 nm and the integration time was 2 s.

![Raman spectrum graph]
**Figure S4.** Raman spectra of SiO$_2$@Ag and SiO$_2$@Ag@GO on Si substrate.

**Figure S5.** (A) UV-vis absorption spectra of unabsorbed 4-ATP after incubating SiO$_2$@Ag and SiO$_2$@Ag@GO with $10^{-4}$ M 4-ATP solutions for 12 h and removing SiO$_2$@Ag NPs and SiO$_2$@Ag@GO NCs by centrifugation. (B) The corresponding Raman spectra of 4-ATP on SiO$_2$@Ag and SiO$_2$@Ag@GO.
Figure S6. (A) UV-vis absorption spectra of 4-ATP at different concentrations ranging from 5 µM to 100 µM, and (B) the corresponding calibration curve.

Figure S7. SERS spectra of different concentrations (10^{-4} M, 10^{-5} M, 10^{-6} M and 10^{-7} M) of 4-ATP absorbed on SiO_2@GO substrates. The excitation wavelength is 532 nm and the integration time is 5 s.
Figure S8. SERS spectra of $10^{-4}$ M of CV and RhB absorbed on SiO$_2$@Ag@GO substrates. The excitation wavelength is 532 nm and the integration time is 5 s.

Figure S9. Raman spectra of SiO$_2$@Ag@GO on Si substrate at different concentrations of GO. The excitation wavelength is 532 nm and the integration time is 5 s.
Figure S10. SERS spectra of SiO$_2$@Ag (A) and SiO$_2$@Ag@GO (B) from 10 random points chosen from different batches of SERS substrates. (C) Raman intensities of 4-ATP at 1076 cm$^{-1}$ on SiO$_2$@Ag and SiO$_2$@Ag@GO substrates are significantly different (two sample t-test, $p<0.05$). The excitation wavelength is 532 nm and the integration time is 5 s.