Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Surface-enhanced Raman scattering using monolayer graphene-encapsulated Ag nanoparticles as a substrate for sensitive detection of 2,4,6-trinitrotoluene

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1. AFM image of the CVD-grown graphene on copper.

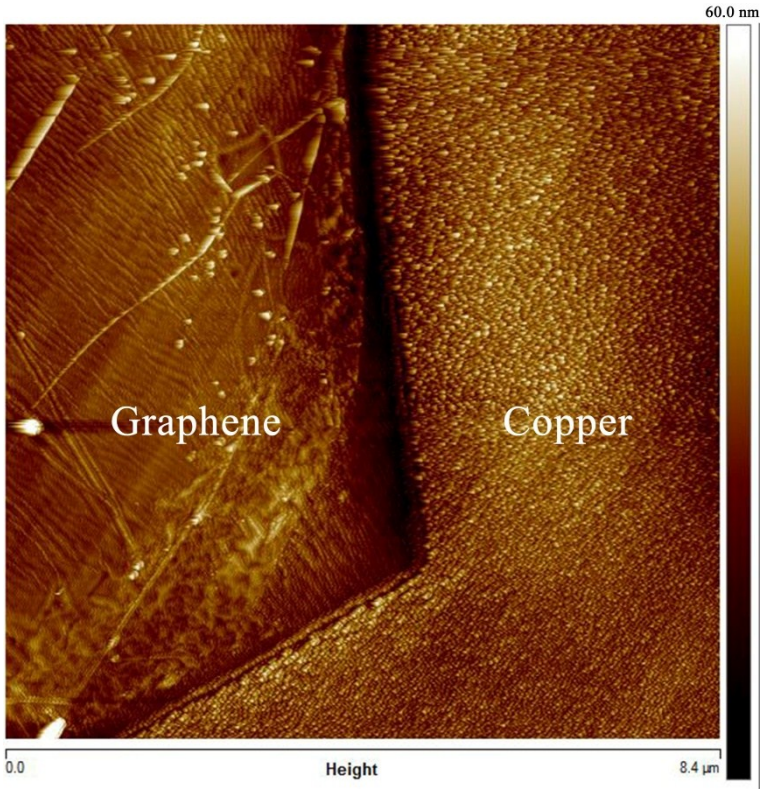

Fig. S1. AFM image of the CVD-grown graphene on copper.

2. SEM image and EDS spectrum of as-synthesized graphene-encapsulated Ag NPs.

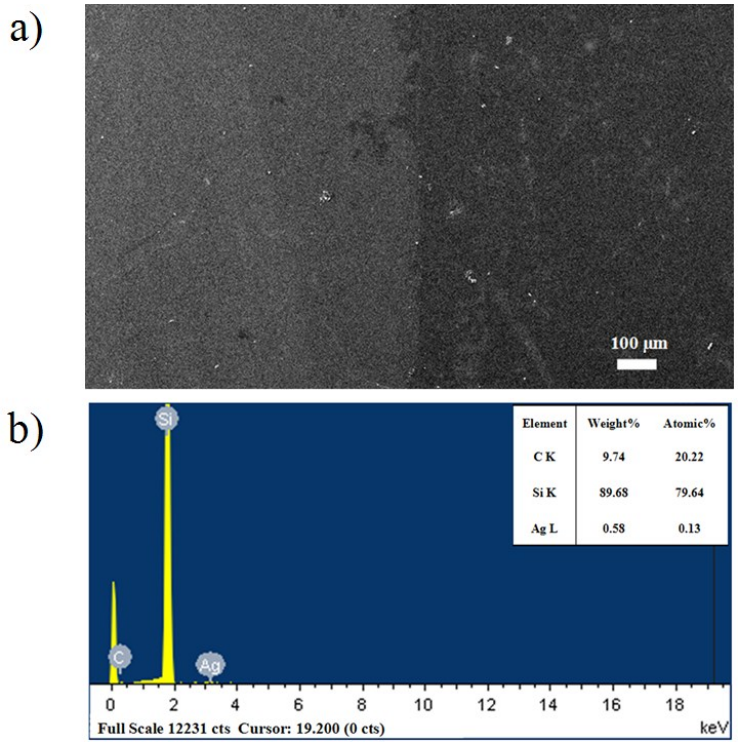

Fig. S2. (a) SEM image of the fresh as-synthesized Ag NPs (bright zone) and the graphene-encapsulated Ag NPs (dark zone); and (b) Energy dispersive spectrum (EDS) of the graphene-encapsulated Ag NPs.

3. Raman enhancement factor.

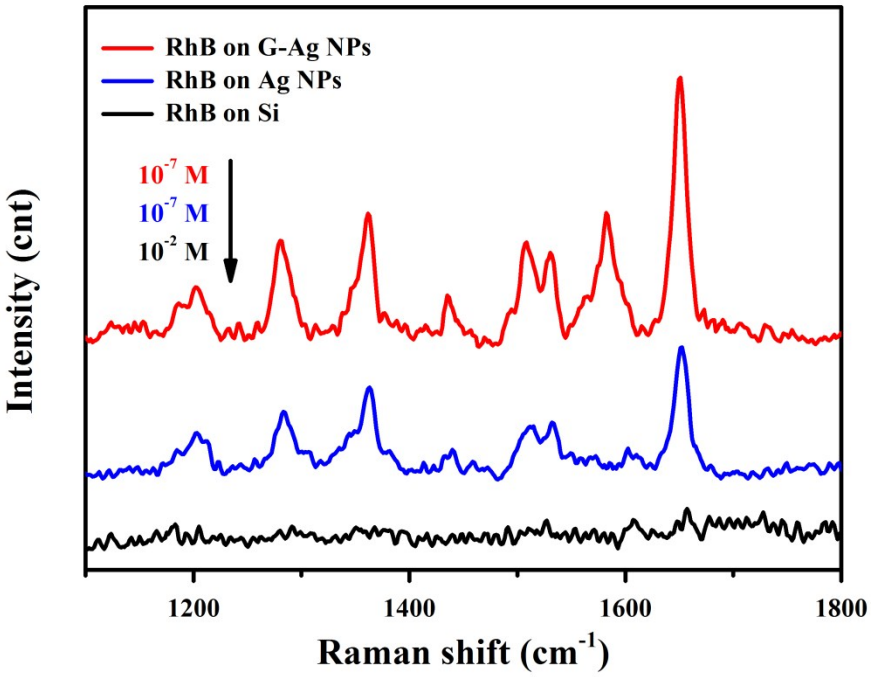

Fig. S3. Raman spectra of 10^{-2} mol L^{-1} RhB on Si (black), 10^{-7} mol L^{-1} RhB on the Ag NPs (blue) and 10^{-7} mol L^{-1} RhB on the graphene-encapsulated Ag NPs (red).

4. Investigation of protective effects of graphene in air.

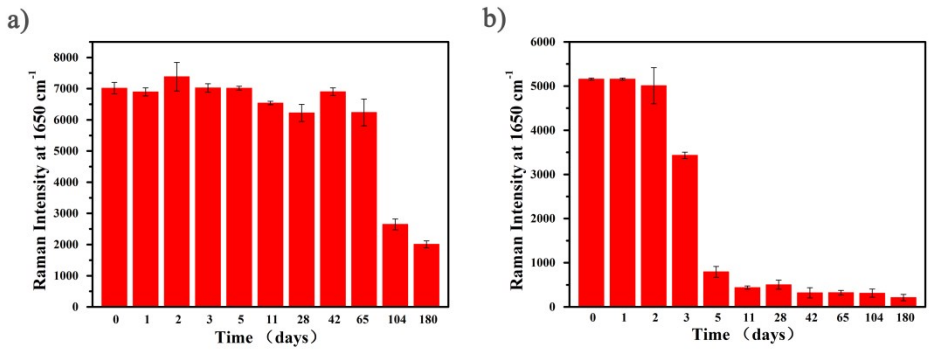

Fig. S4. Raman intensity of RhB@1650 cm^{-1} on the graphene-encapsulated Ag NPs (a) and the bare Ag NPs (b) at different time.

5. Influence of temperature on Raman enhancement effect.

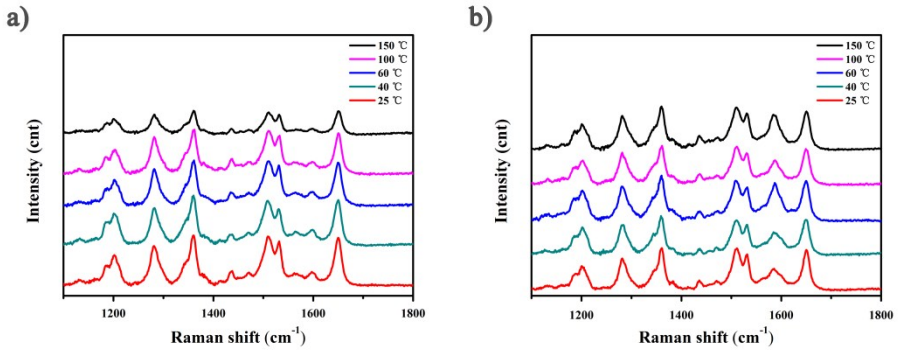

Fig. S5. Raman spectra of RhB on the bare Ag NPs (a) and the graphene-encapsulated Ag NPs (b) under different temperature annealed for 0.5 h.

6. Investigation of stability of bare Ag NPs and graphene-encapsulated Ag NPs in different media.

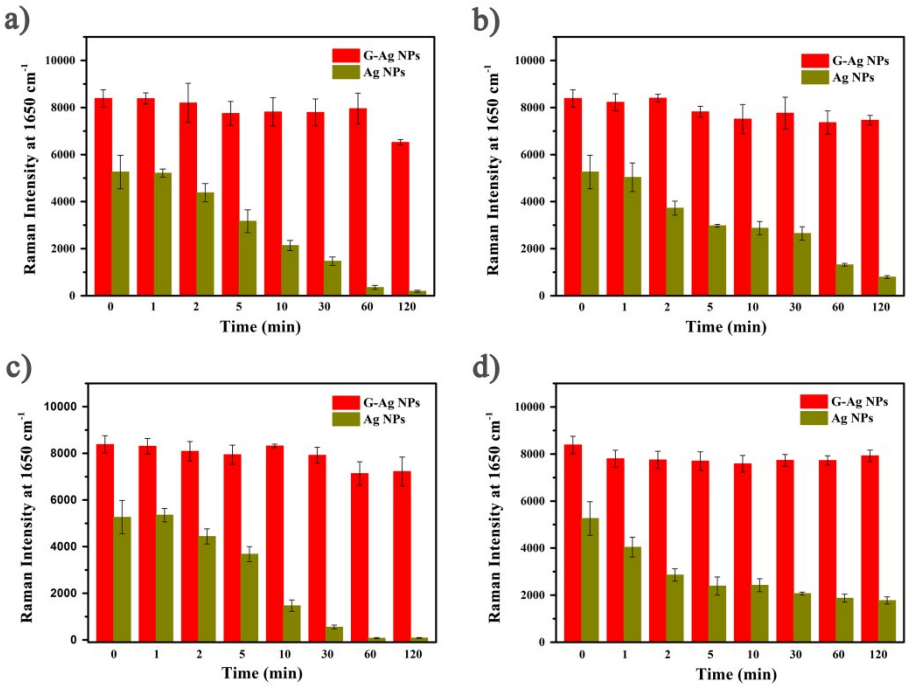

Fig. S6. Stability of the graphene-encapsulated Ag NPs and the Ag NPs. Time-dependent Raman intensity of RhB@1650 cm^{-1} in (a) 6% H_2O_2; (b) 0.5 mmol L^{-1} Na_2S; (c) 0.5 mol L^{-1} HNO_3 and (d) NaOH (pH 13).

7. Investigation of stability of silver colloid in different media.

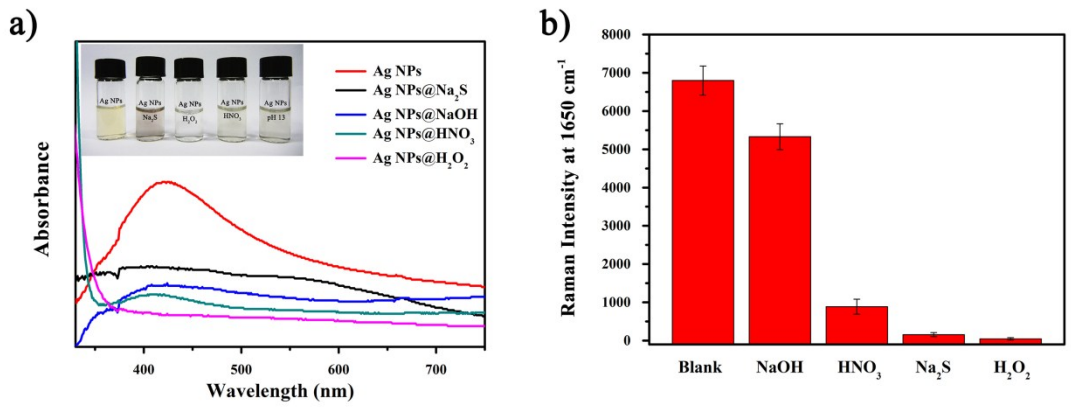

Fig. S7. (a) UV-visible absorption spectra of the bare Ag colloid in 0.5 mmol L^{-1} Na_2S, NaOH (pH 13), 0.5 mol L^{-1} HNO_3 and 6% H_2O_2, and the inset: the photos of the bare Ag colloid in different media; (b) Raman intensity of RhB@1650 cm^{-1} in Ag colloid with the presence of HNO_3, NaOH (PH 13), Na_2S and H_2O_2.

8. Mass spectra of TNT before and after Fenton oxidation degradation.

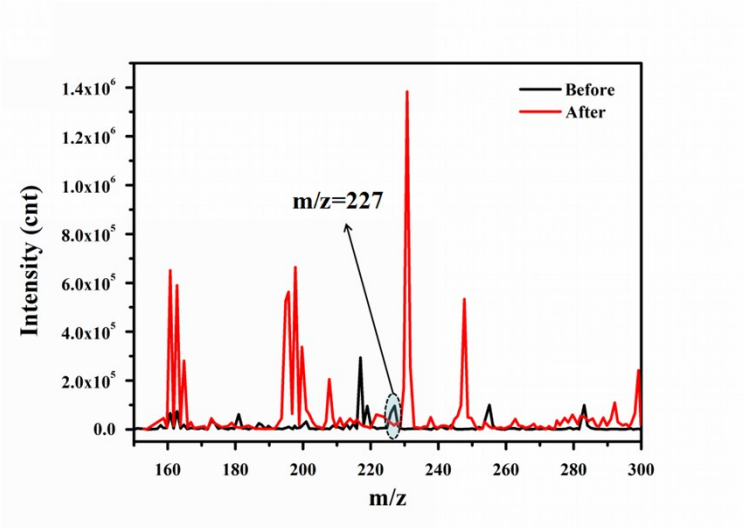

Fig. S8. Mass spectra of 10^{-6} mol L^{-1} TNT (black) and the residue after Fenton oxidation degradation of 10^{-6} mol L^{-1} TNT (red).

9. The comparison of present method with other optical sensors.

Table S1. The comparison of the LOD by the present method with those by other optical sensors.

Method	Materials	Linear range (mol L^{-1})	LOD (mol L^{-1})	Measuring period	Ref.
Fluorescence	CdSe-ZnS QDs	2.2×10^{-6}-4.4×10^{-5}	-	15 min	1
	Si QDs	5×10^{-9}-5×10^{-7}	10^{-9}	2 min	2
	MIP@QDs	5×10^{-8}-6×10^{-7}	1.5×10^{-8}	15 min	3
Luminescence	Au NPs-$NaYF_4$	2.2×10^{-6}-3.5×10^{-5}	-	10 min	4
	Ru/LDH hybrid	4.4×10^{-6}-2.2×10^{-5}	4.4×10^{-6}	-	5
Colorimetric Visualization	Au NPs	5×10^{-9}-5×10^{-13}	-	2h	6
	Au NPs	8×10^{-5} -1.2×10^{-3}	2.7×10^{-5}	-	7
This work	G-Ag NPs	10^{-9}-10^{-7}	6.6×10^{-10}	5 min	-

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