Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Recyclable silver nanoplate-decorated copper membrane for solid-phase extraction coupled with surface-enhanced Raman scattering detection

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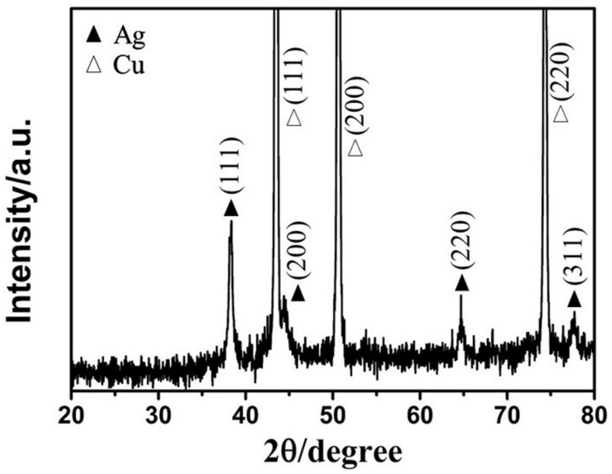

Figure.S1. The XRD patterns of silver nanoplate-decorated copper membrane

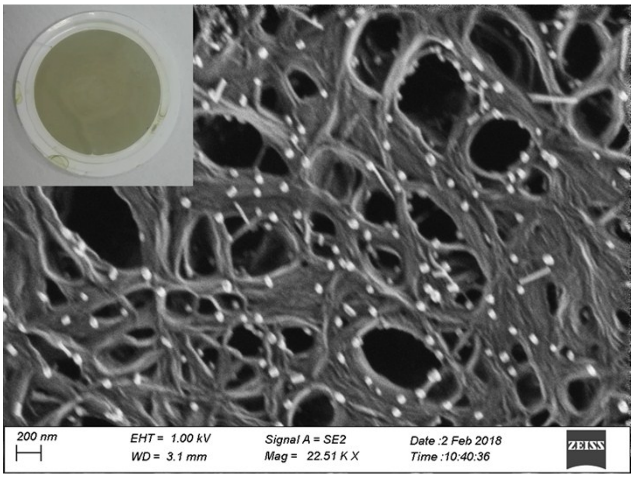

Figure S2. SEM image of silver nanoparticles-loaded filter paper. The inset shows a photograph of the membrane.

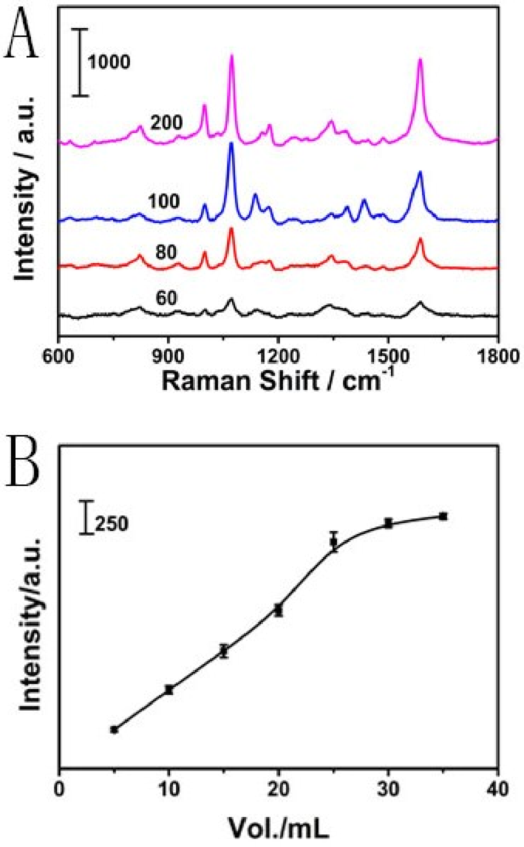

Figure.S3. SERS spectra of PATP versus (A) mesh number of Cu membrane and (B) sample volume

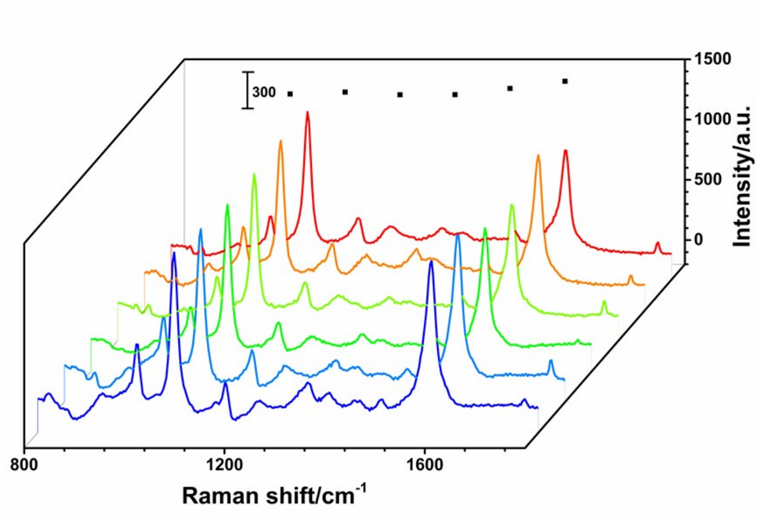

Figure.S4. Long-term stability of silver nanoplate-decorated copper membrane probed with 10^{-6} mol·L^{-1} PATP

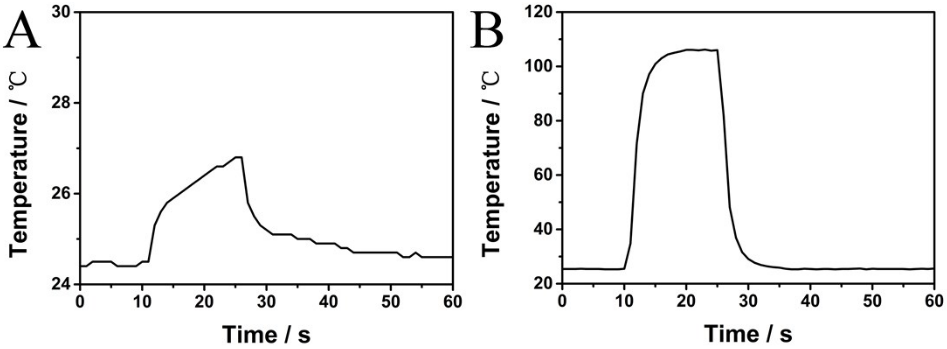

Figure S5. The raw date for temperatures (before and after the laser heating) of (A) silver nanoplate-decorated copper membrane and (B) silver nanoparticles loaded onto the filter paper

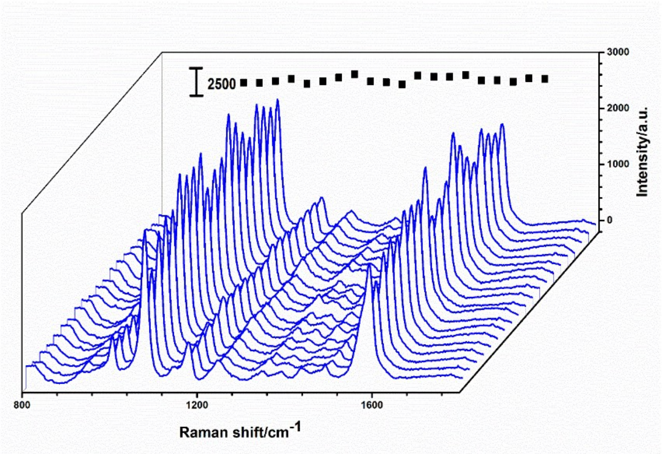

Figure.S6. The uniformity of the substrate probed with 10^{-6} mol·L^{-1} PATP. The inset shows the intensity change of the Raman band centered at 1075 cm^{-1}.

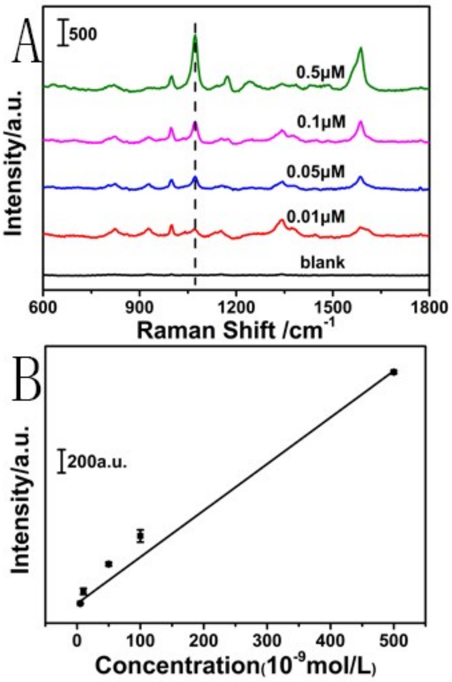

Fig. S7. (A) SERS spectra of the different concentrations of PATP in aqueous solution absorbed on the membrane by the flow-through method. (B) Linear fitting for PATP at the 1075 cm^{-1}. The data points represent the average of three times parallel measurements

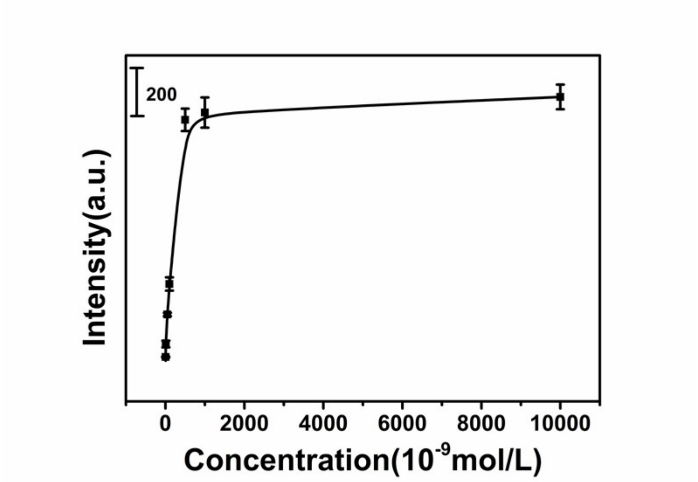

Figure.S8. Plot of the intensity of the 1076 cm^{-1} SERS peak for different PATP concentrations in aqueous solution

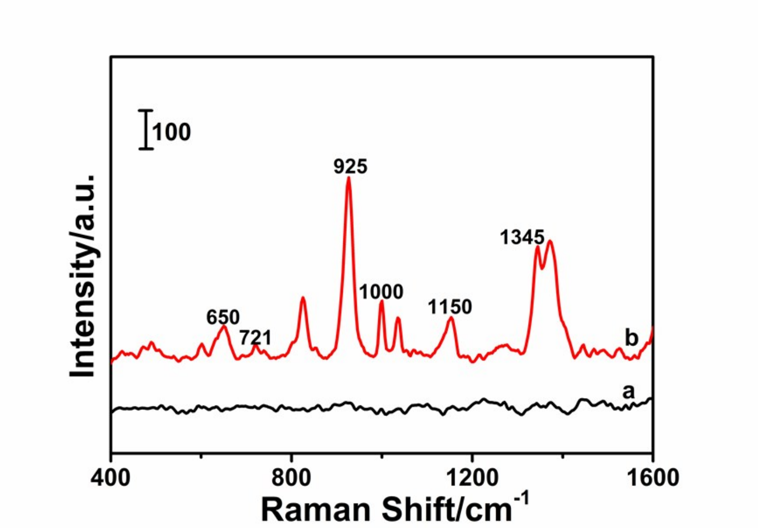

Figure.S9. SERS spectra of phorate. (Curve 'a '- SERS spectrum of the blank sample)

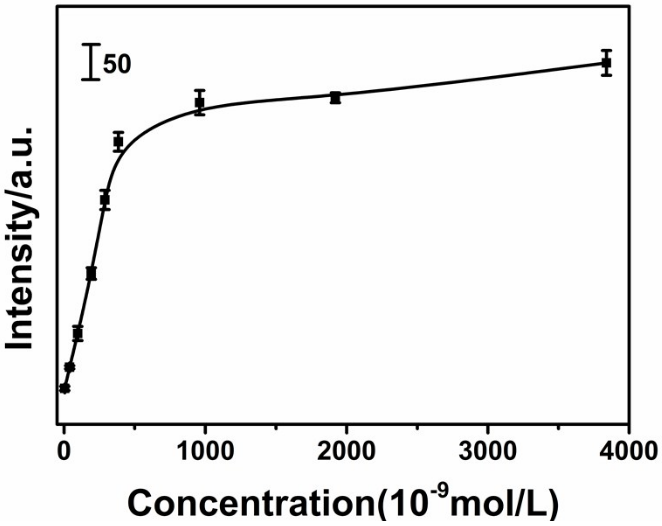

Figure.S10. Plot of the intensity of the 925 cm^{-1} SERS peak for different phorate concentrations in aqueous solution

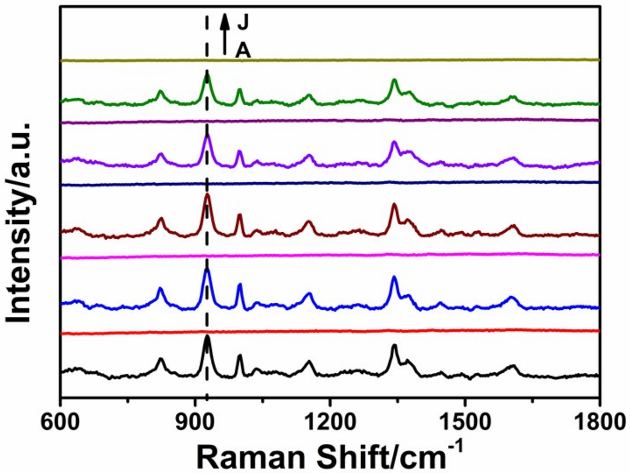

Figure S11 SERS spectra of phorate from the five cycles of the reusability test. (A,C,E,G,I - 20 mL solution was filtered on substrate). (B,D,F,H,J - substrate was immersed in $NaBH_4$ removal solution for 5 min.)

The reproducibility was also examined from the investigation of adsorption/desorption process of 3.84×10^{-6} mol·L^{-1} phorate. The steps are the same as before. The SERS spectra after each adsorption/desorption process cycle were recorded in Fig.S9, where we can see strong characteristic Raman peaks at 925, 1000, 1150, and 1345 cm^{-1} of phorate (A, C, E, G and I). The RSD was found as 14.66%.The SERS spectrum was collected after the substrate was treated with the removal resolution as shown in Fig. 4B, D, F, H and J. As could be clearly seen, the peaks of PATP was no longer exists, which indicates that the molecules were completely removed.

	Underground water	Surface water	Drinking water
R^2	0.987	0.983	0.990
LOD(S/N=3)	0.164μmol/L	0.227μmol/L	0.096 μmol/L
Recovery	97.9%	103.6%	98.7%

Table S1 Quantitative analysis results for the actual water

Methods	Linear range	R^2	LOD(S/N=3)
GC-MS[1]	10-500 ng/ml	0.99	16 ng/ml
HPLC[2]	54.5-1089.0 ng/ml	0.99	5 ng/ml
Our method	100-10^4 ng/ml	0.98	59.1 ng /ml

Table S2 The analytical performances of phorate compared with other methods

References

1. C. G. Zambonin, M. Quinto, N. De Vietro and F. Palmisano, *Food Chemistry*, 2004, **86**, 269-274.
2. L. He, X. Luo, H. Xie, C. Wang, X. Jiang and K. Lu, *Anal Chim Acta*, 2009, **655**, 52-59.