Electronic Supplementary Information for

Silver nanoparticles decorated filter paper via self-sacrificing reduction for membrane extraction surface-enhanced Raman spectroscopy detection

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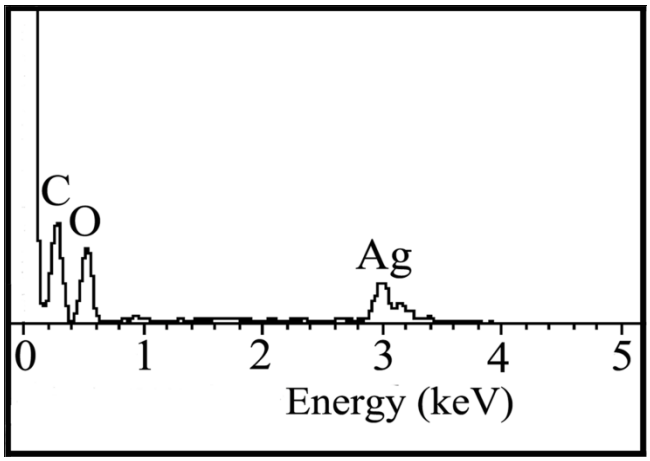

Fig. S1 EDS of reacted filter paper.

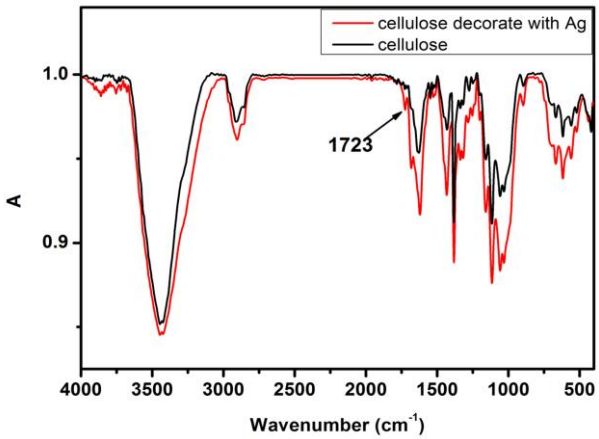

Figure S2. IR of raw and reacted filter paper.

Table S1. Elemental analysis of three points selected randomly on the reacted paper.

Element	Weight percent	atom percent
C	40.08 36.28 37.77	49.53 47.81 48.73

O	53.44 50.85 51.31	49.58 50.30 49.70
Ag	6.48 12.87 10.92	0.89 1.89 1.57

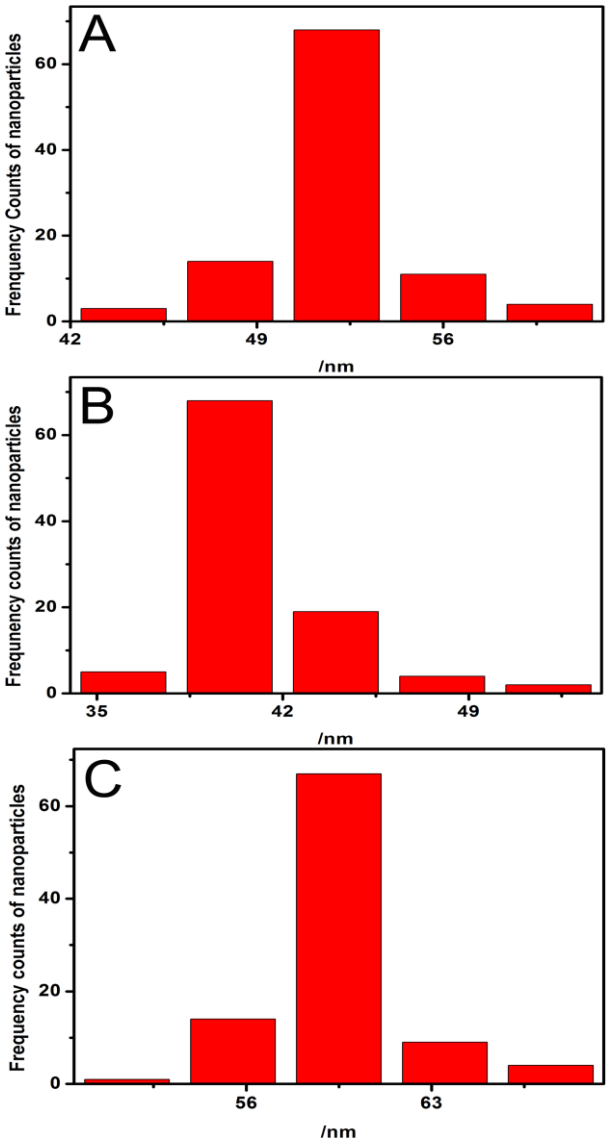

Fig. S3 Diameter statistics analysis of silver nanoparticles synthesized by 1 mM $Ag(NH_3)_2OH$ with reaction time of 50min(A) and 8 mM $Ag(NH_3)_2OH$ with reaction time of (B) 10 min, (C) 50 min.

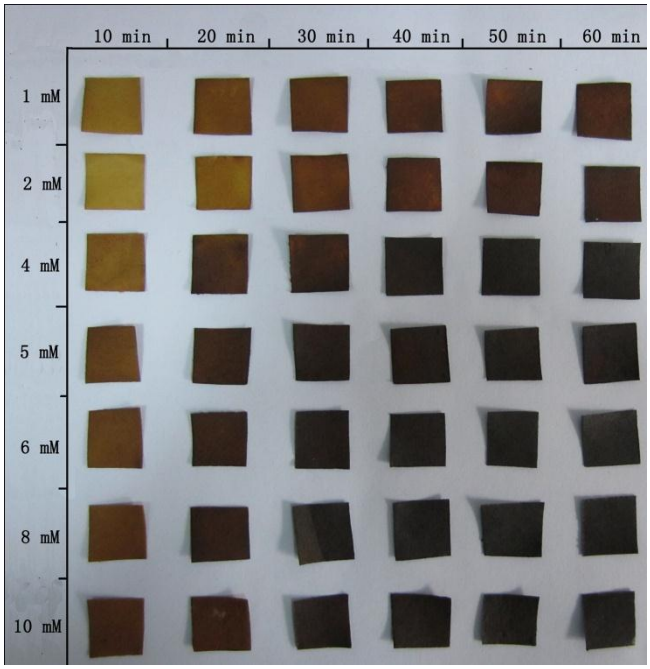

Fig. S4 image of filter paper synthesized under different contentrations of $Ag(NH_3)_2OH$ with varied reaction time.

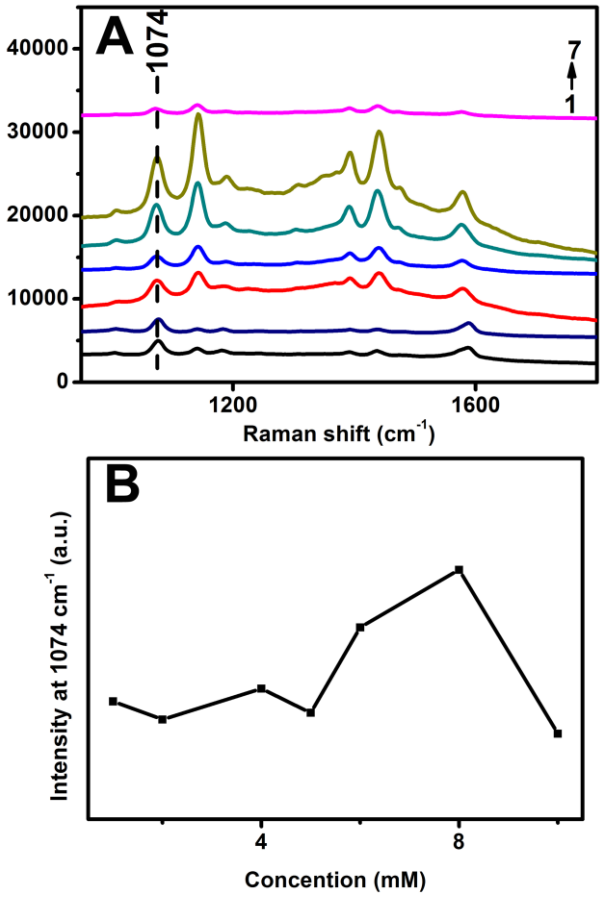

Fig. S5 (A) Raman spectra of PATP detected on filter paper substrates obtained in 1, 2, 4, 5, 6, 8 and 10 mM $Ag(NH_3)_2OH$ solution corresponding to 1→7. (B) Diagram of SERS intensities of PATP at 1076 cm^{-1} versus concentrations of $Ag(NH_3)_2OH$.

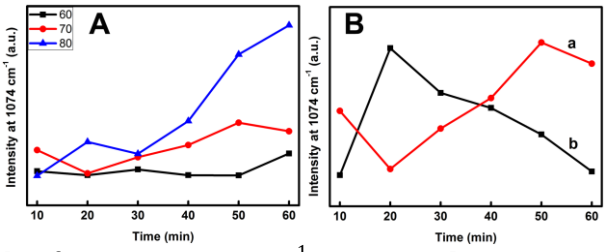

Fig. S6 (A) SERS signals of PATP at 1074 cm^{-1} corresponding to time for substrates reacted at 60 ℃, 70 ℃ and 80 ℃. (B) SERS intensity of PATP at 1074 cm^{-1} versus time for slow speed filter paper (a) and medium speed filter paper (b).

The calculation of enhancement factor(EF)

The enhancement factor(EF) was calculated by the following equation:

$EF=(I_{SERS}/I_{Raman})\cdot(N_{bulk}/N_{ads})$

$N_{ads} = A/A_{sum} \cdot V_{ads}\cdot C_1$

$N_{bulk}= A\cdot H_{eff}\cdot C_{sol}$

$EF =(I_{SERS}/I_{Raman})\cdot(A_{eff} \cdot H_{eff} \cdot C_{sol})/ (A_{eff} /A_{sum} \cdot V_{sum}\cdot C_1)$

$=(I_{SERS}/I_{Raman}) \cdot(A_{sum}\cdot H_{eff}\cdot C_{sol})/ (V_{ads}\cdot C_1)$

$=0.99\ M \cdot I_{SERS}/(I_{Raman} \cdot C_1)$

N_{ads} is the number of MPY molecules under laser radiation adsorbed on substrate;
A_{eff} is the effective area of spot size;
A_{sum} is the area of the paper substrate, 3 mm×3 mm;
V_{ads} is the volume that is spotted onto the paper substrate, 10 μL;
C_1 is the concentration of the solution that is to be measured.

N_{bulk} is the number of MPY molecules in the scattering volume in bulk solution;
Heff is the effective length of of the scattering volume and here was estimated as the depth of field, 2.2 mm;
C_{sol} is 0.5 M MPY solution for the non-SERS measurement.
The detail of the calculation of enhancement factor was enclosed in electronic supplementary information.