Supporting Information

Improving SERS Hot Spots for On-Site Pesticide Detection by Combining Silver Nanoparticles with Nanowires

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The preparation of AgNWs: The synthetic method of AgNWs was based on previously published literature.[1] AgNWs were prepared by a polyalcohol reduction method in the presence of polyvinylpyrrolidone (PVP) as a surfactant. 0.16g of PVP (MW~1,300,00) and 0.16g of PVP (MW~58,000) were mixed and dissolved in 44 mL of EG to form a colorless and transparent solution. Then 5mL of $FeCl_3$ solution (600 μM in EG) and 6 mL of $AgNO_3$ solution (0.35 M in EG) were added rapidly to the above solution within two mins. Subsequently, the mixed solution was transferred into a flask and heated at 140 °C for 2 hours. After the reaction was finished, the precipitate was naturally cooled to room temperature. The obtained solution was centrifuged and washed with ethanol absolute and deionized water three times and redispersed in 50 mL ethanol. A final AgNWs-alcohol dispersion was obtained.

The expression of theoretical SERS EM coupling: In general, the local field intensity enhancement factor (LFIFE) can be described as [2]

$$\mathrm{LFIEF}(r,\omega) = \left|E(r,\omega)\right|^2 \Big/ \left|E_0(r,\omega)\right|^2 \tag{1}$$

where $E(r,\omega)$ is the local electric field amplitude, $E_0(r,\omega)$ is the incident field amplitude. SERS benefits from both the emission and excitation enhancement, which is known as LFIEF at corresponding frequency of ω_L and ω_s, respectively. Therefore the SERS enhancement factors (EF) can be written as the following equation:

$$\mathrm{EF} = \mathrm{LFIEF}(r,\omega_L) \times \mathrm{LFIEF}(r,\omega_s) \tag{2}$$

The equation (2) is an approximation to the real expression of EF for SERS at a given point r with all the above approximation included reads:[3, 4]

$$\mathrm{EF}=\mathrm{LFIEF}(r,\omega_L) \times \mathrm{LFIEF}(r,\omega_S) = \left|E(r,\omega_L)\right|^2 \times \left|E(r,\omega_S)\right|^2 \Big/ \left|E_0(r,\omega)\right|^4 \tag{3}$$

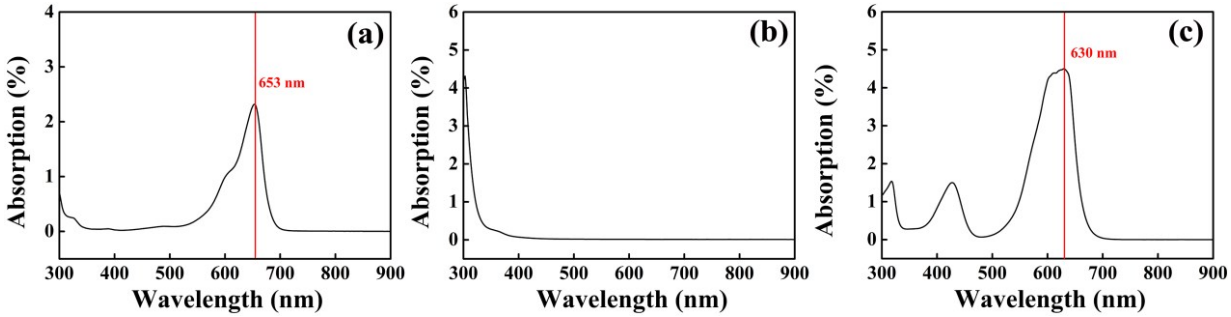

Figure S1. The UV–vis absorption spectra of (a) MB, (b) thiram and (c) MG aqueous solution.

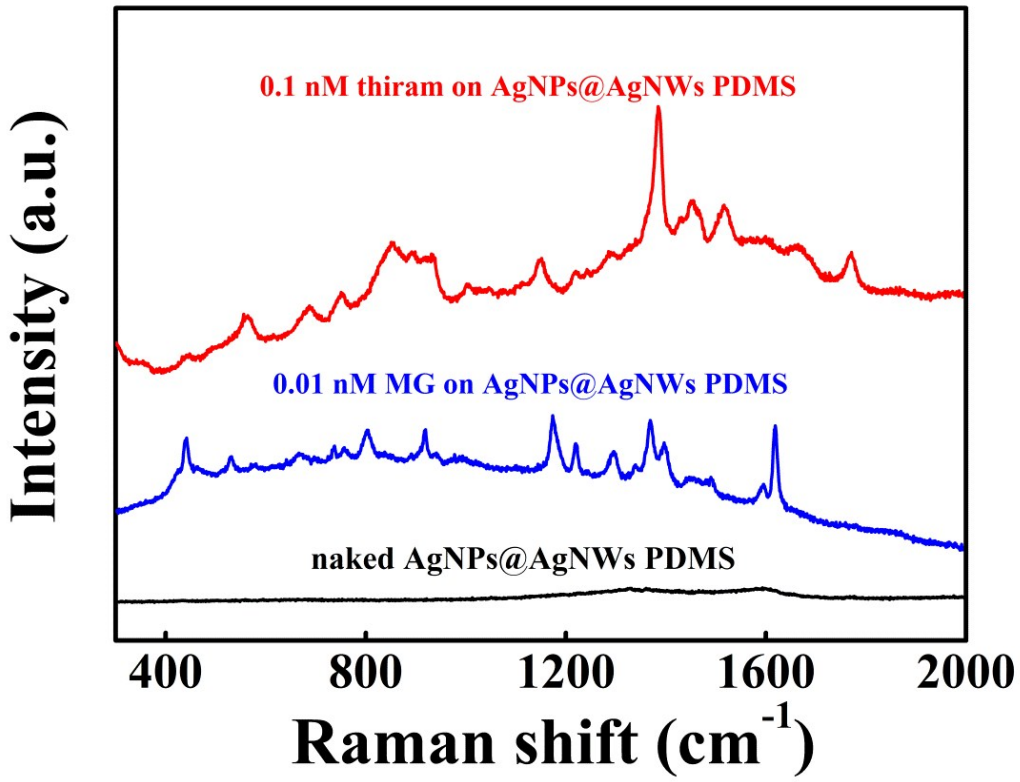

Figure S2. The Raman scattering spectra of 0.1 nM thiram on AgNPs@AgNWs PDMS, 0.01 nM MG on AgNPs@AgNWs PDSM and naked AgNPs@AgNWs PDMS.

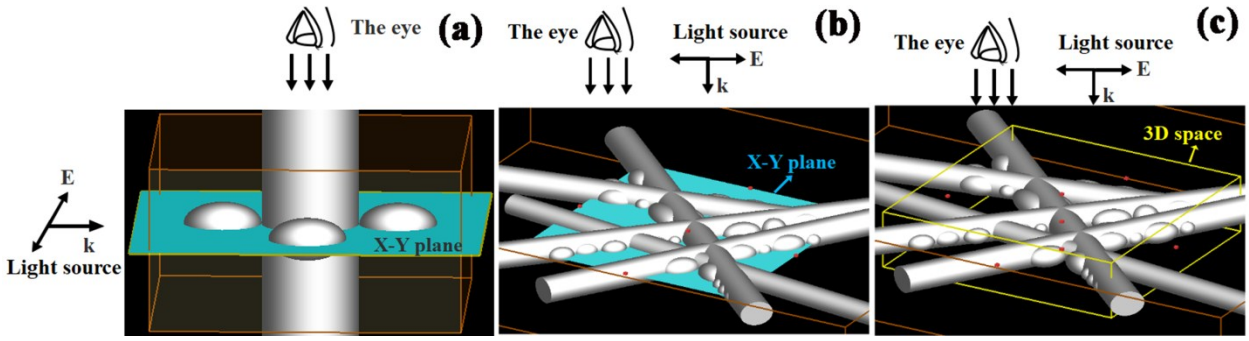

Figure S3. (a) The XY-view of predicted results of **Figure 2**, (b) XY-view and (c) 3D-view of practice sample of **Figure 4.**

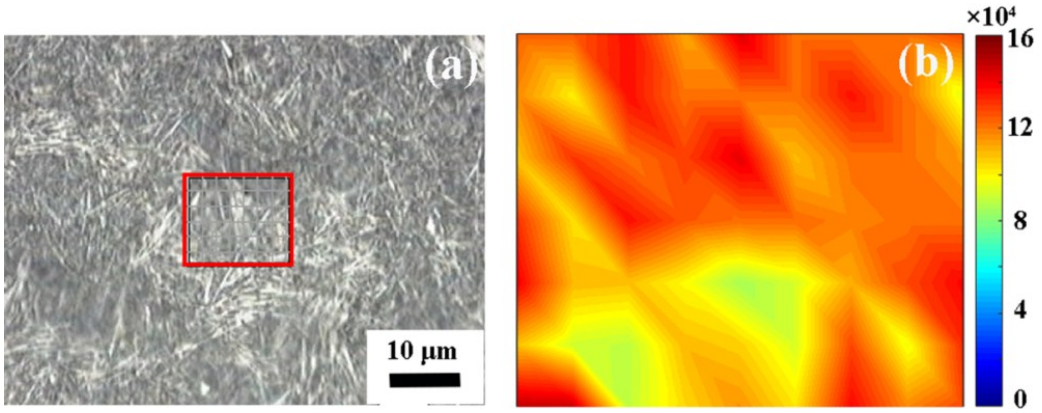

Figure S4. (a) The Raman mapping viewer after the 10^{-6} M dried on the Au/DW-45, the Raman mapping was taken to demonstrate the uniformity across the red rectangle region (step size is 2 μm, 15 ×12 μm^2). (b) The Raman intensity at 1386 cm^{-1} of 63 fixed sites was recorded and displayed. All active sites showed a relatively consistent Raman intensity, and no obvious particle-like structure was observed in this region. This result evidently indicates the network structure has a good uniformity and SERS reproducibility.

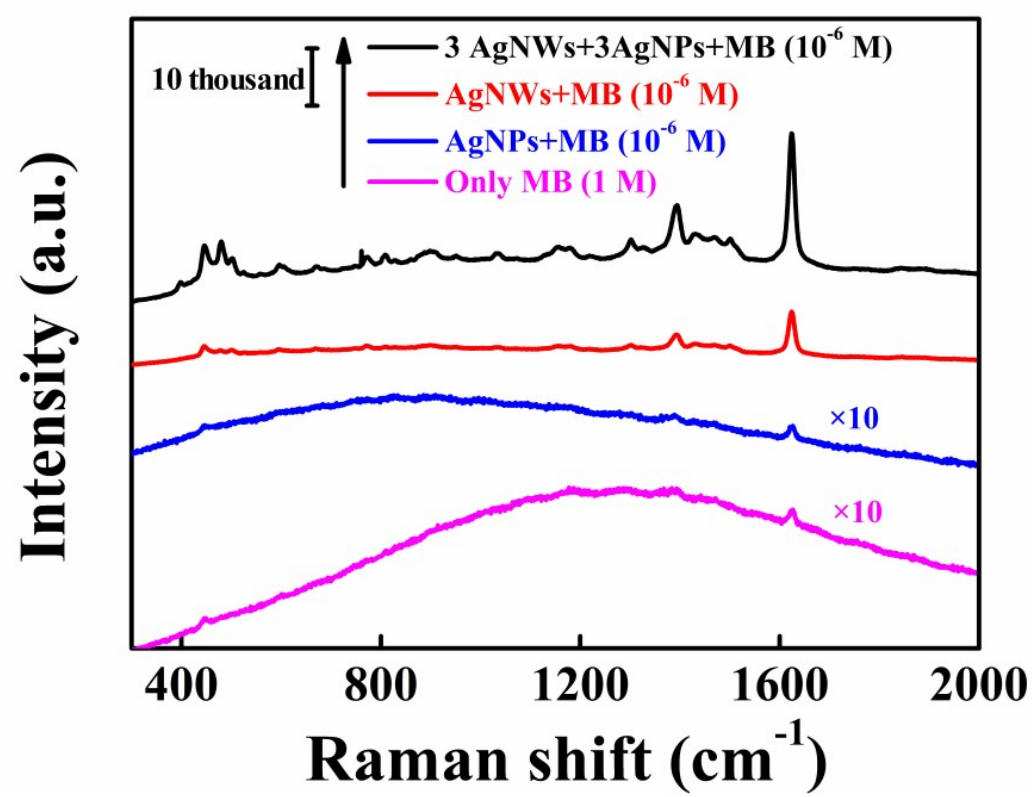

Figure S5. The detection of MB by SiO_2/Si, AgNPs PDMS, AgNWs PDMS and AgNPs@AgNWs PDMS. The corresponding EF of AgNWs+AgNPs, AgNWs and AgNPs are 1.49×10^9, 4.78×10^8 and 6.53×10^5, respectively.

Table S1. Assignments and main Raman shifts (cm^{-1}) for SERS spectra of thiram and MG

	thiram	
vibrational description	observed	Reported[5,6]
C-N stretching, CH_3 deformation	1514	1508
C-N Stretching, CH_3 deformation	1386	1393
CH_3N stretching	1145	1132
S-S stretching	561	556
	MG	
vibrational description	observed	Reported[7]
C−C ring stretching	1618	1618

N-phenyl stretching	1368	1375
C−H ring in-plane bending	1175	1181
C−H out-of-plane bending	917	920
C−H out-of-plane bending	806	811

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