

## Supporting information

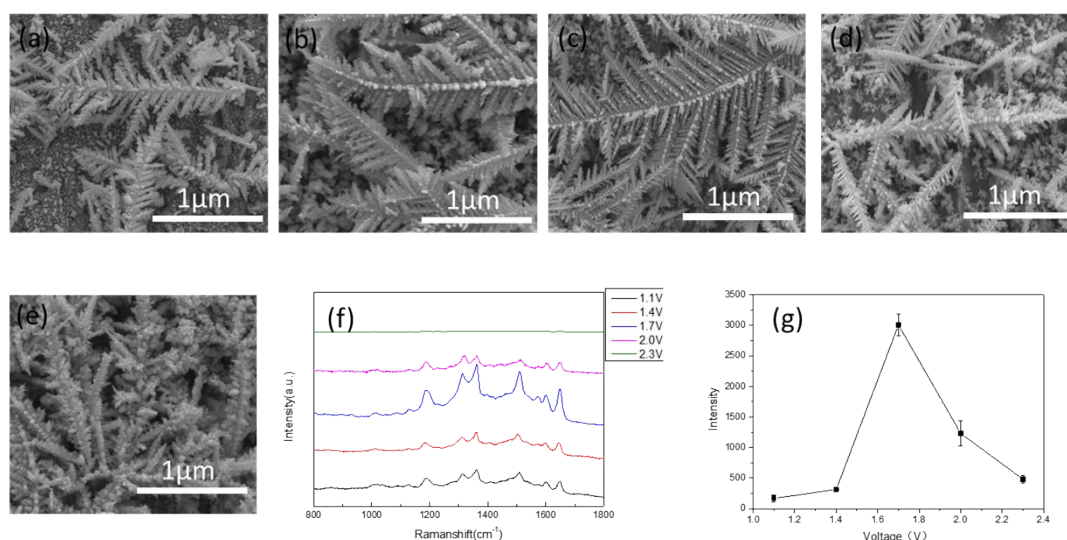
### In-situ monitoring the plasmon catalytic reaction of P-nitroaniline at gas-liquid-solid three phase interface

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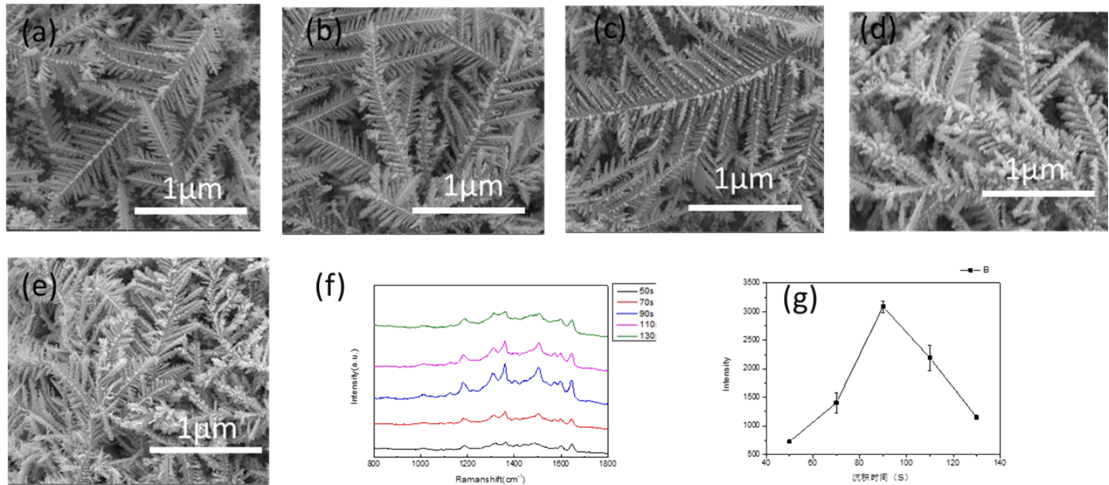
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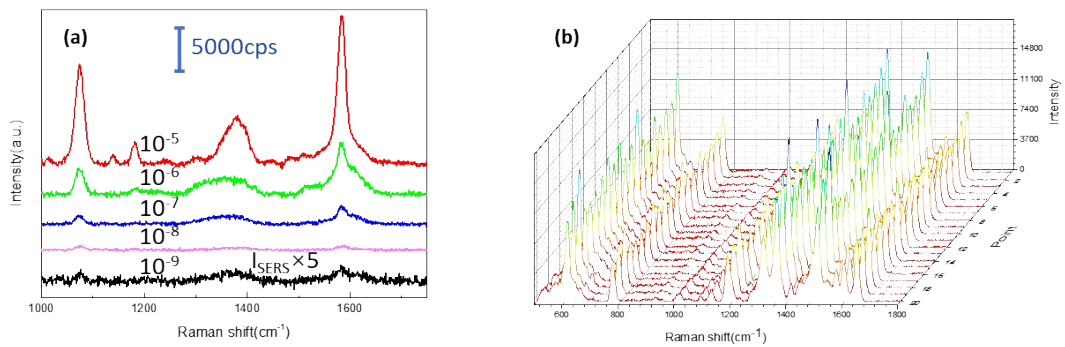
E-mail address: pgyin@buaa.edu.cn (P. Yin), gaoyukun@buaa.edu.cn (Y. Gao).



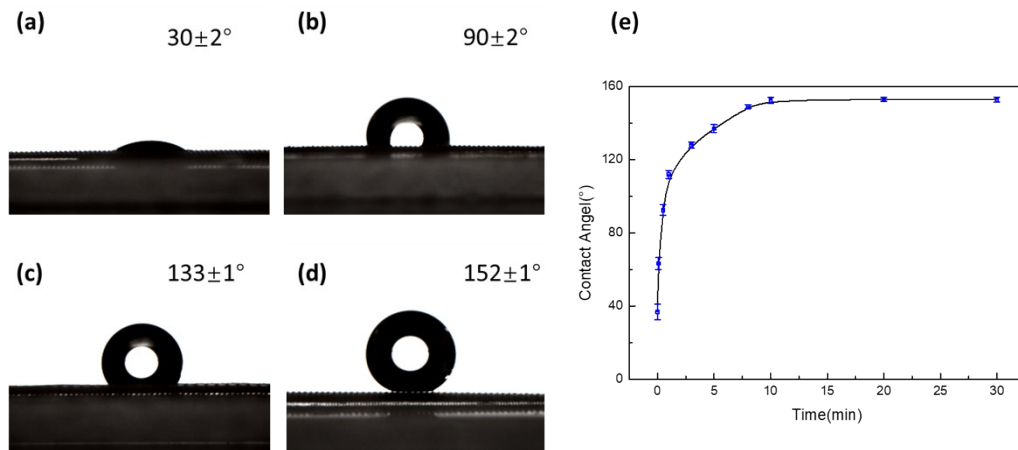
**Figure S1.** Effect of deposition voltage on substrate properties (a-e) SEM images of nano substrates obtained after deposition for 90 s under different voltages; (f) comparison of Raman spectra measured after immersion of substrates in  $10^{-6}$  mol / L R6G solution; (g) comparison of peak intensities at  $1365\text{ cm}^{-1}$ .



**Figure S2.** Effect of deposition time on substrate properties (a-e) SEM images of nano substrates deposited at 1.7 V for different times; (f) comparison of Raman spectra measured after substrates immersed in  $10^{-6}$  mol / L R6G solution; (g) comparison of peak intensities of  $1365\text{cm}^{-1}$ .

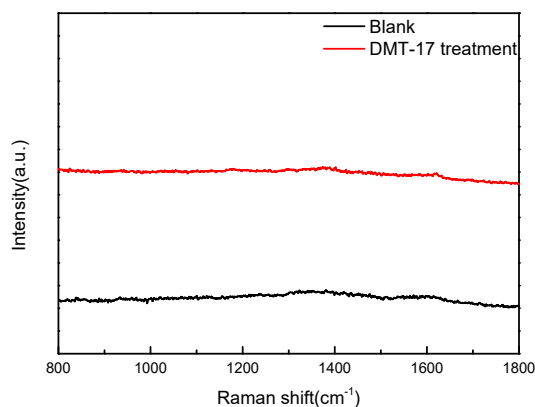


**Figure S3.** SERS performance of the Ag nanostructure/Cu mesh SERS substrate (a) Raman spectra obtained by detecting different concentrations of PMBA solution using nano silver dendritic copper mesh substrate. (b) Uniformity detection of SERS activity on nano-silver dendritic substrate.

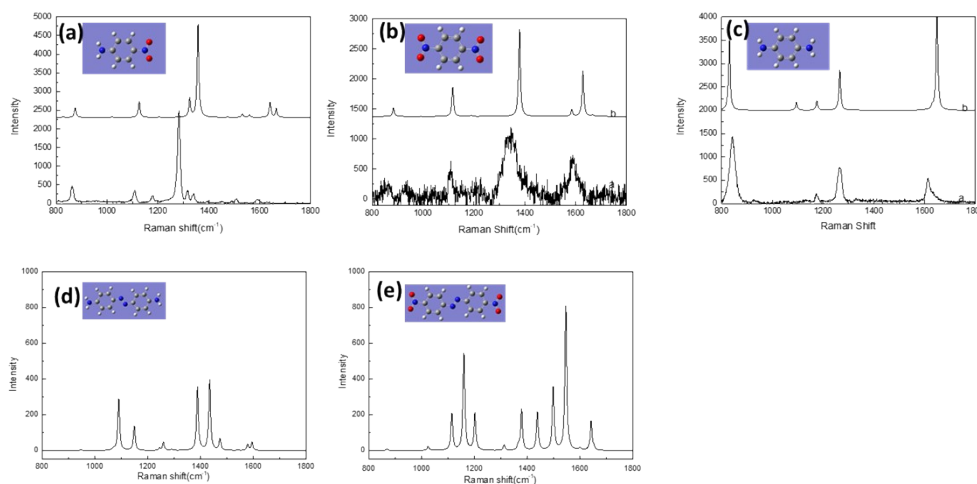


**Figure S4** Surface wettability treatment of Ag nanostructures/Cu mesh substrate (a-d) the contact

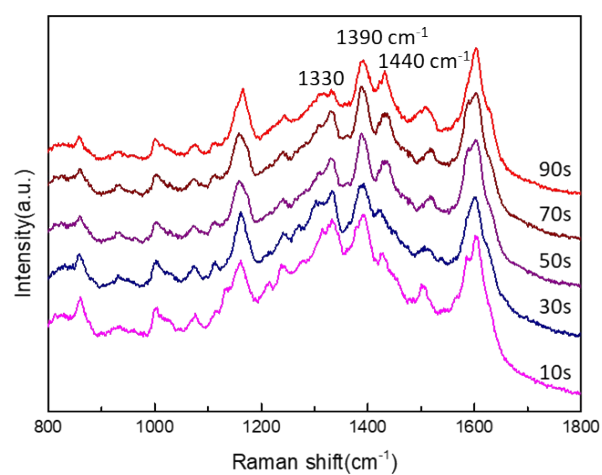
angle images of the substrate under different processing time. (e) the change of the substrate contact angle with the processing time.



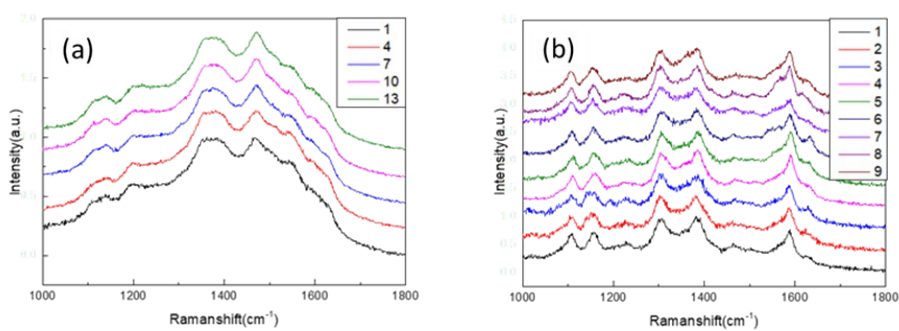
**Figure S5.** Raman spectra of the Ag nanostructures/Cu mesh SERS substrate before and after DMT-17 treatment.



**Figure S6.** DFT calculation results (a) Raman spectra of PNA powder and DFT calculated Raman spectra of PNA; (b) Raman spectra of DNB powder and DFT calculated Raman spectra of DNB; (c) Raman spectra of PDA powder and DFT calculated Raman spectra of PDA; (d) DFT calculated Raman spectra of DAAB; (e) DFT calculated Raman spectra of DNAB.



**Figure S7.** Time-depending Raman spectra of the hydrophilic substrate immersed in PNA solution



**Figure S8.** Surface plasmon reaction of DNB and PDA molecules on the substrate (a) Raman spectra of DNB solution(anaerobic) with the extension of 633 nm laser irradiation time; (b) Raman spectra of PDA droplets with the extension of 633 nm laser irradiation time ( $AC=150^\circ$ ).