Electronic Supplementary Information

Gold Microsheets Having Nano/Microporous Structures

Fabricated by Ultrasonic-Assisted Cyclic Galvanic Replacement

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Telephone/Fax: +662 218 7585
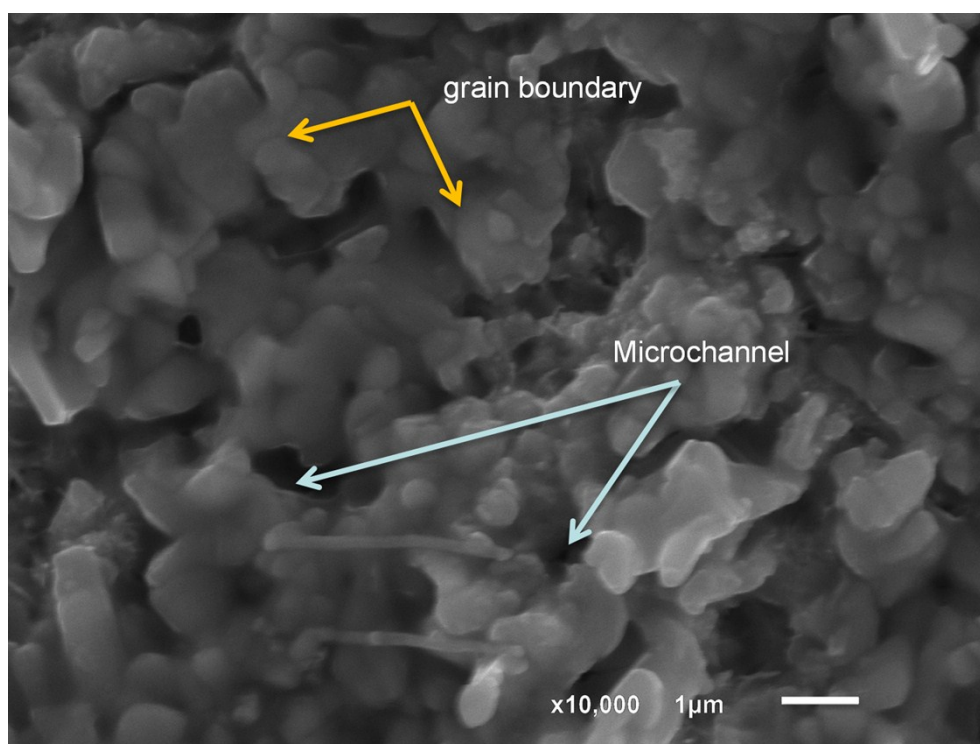
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Fig. S1   Solution-exposed side SEM micrograph of Galvanized layer reveals the grain

boundary between particles and the microchannel with the size of 0.5–1 μm
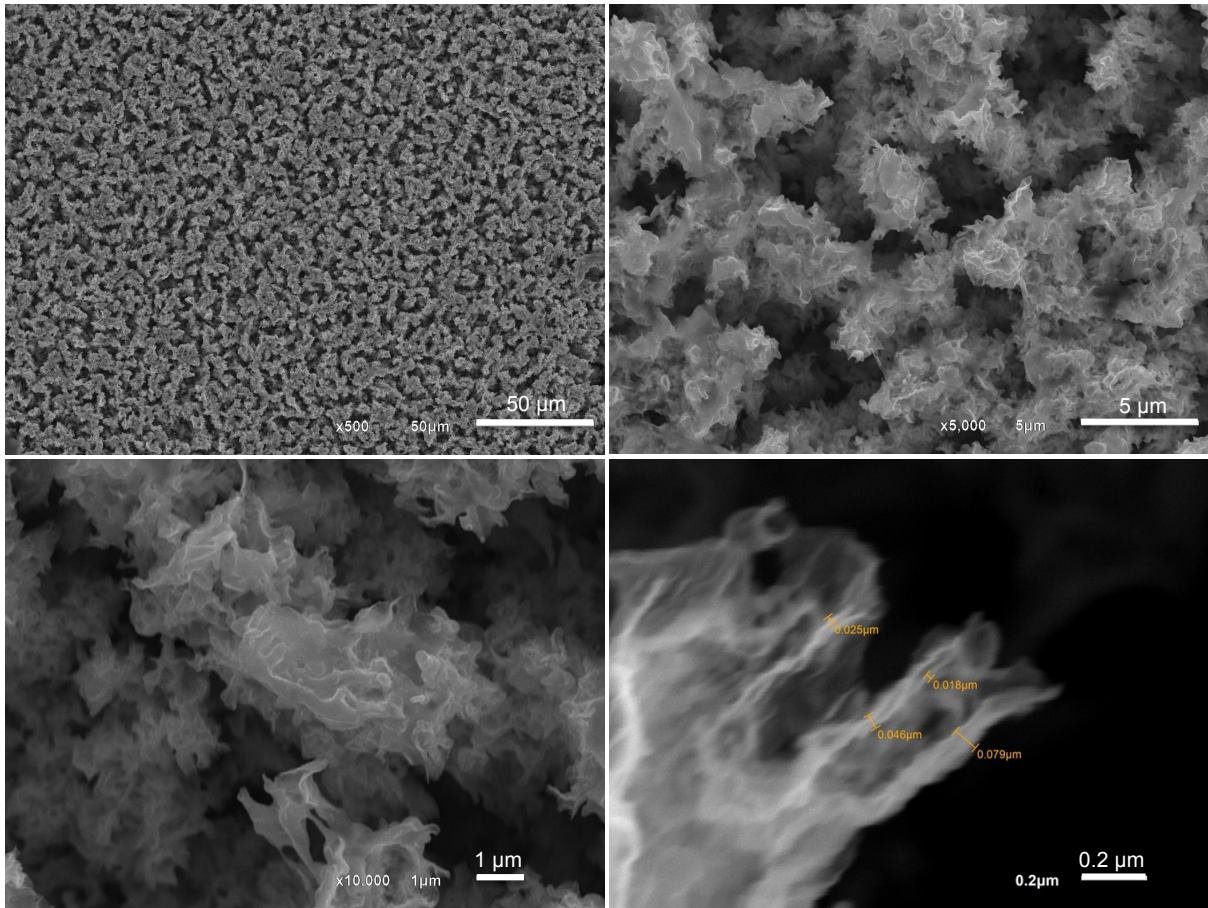
inside particles.

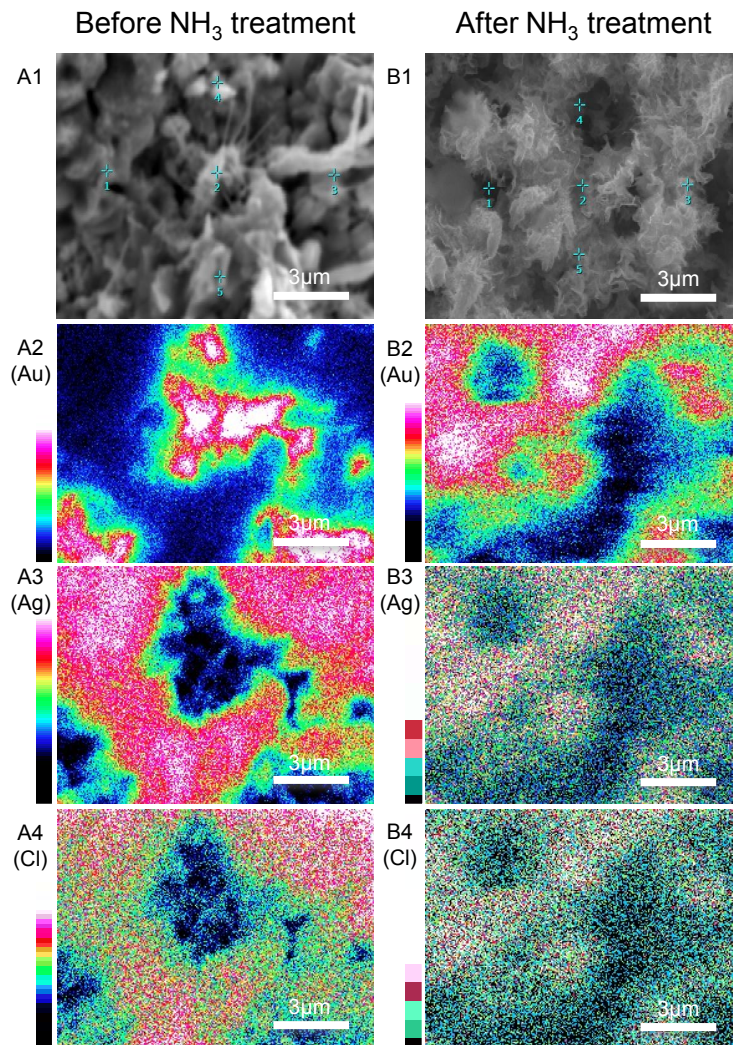Fig. S2   SEM micrographs of Galvanized layer after NH₃ treatment.

Fig. S3   EDS mapping images reveal the distribution of Au, Ag, and Cl in Galvanized

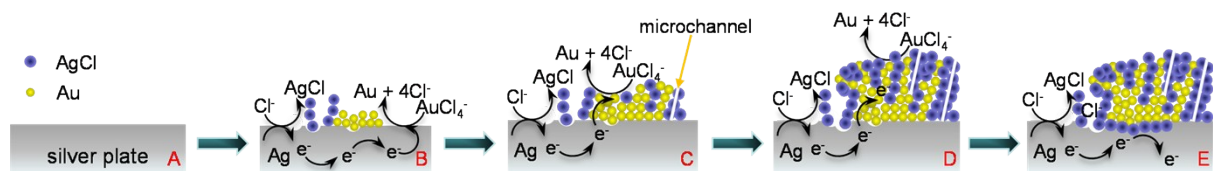layers (A) before and (B) after NH$_3$ treatments.

Fig. S4 The proposed formation mechanism of Au/AgCl micro/nanocomposites on a sacrificed Ag surface. (A) A clean Ag surface. (B) Rapid epitaxial growth of Au film on a clean Ag surface. (C) Precipitation and formation of AgCl precipitates on a Au film. (D) The formation of interpenetrated Au/AgCl nanocomposites. (E) The development of AgCl underlayer.
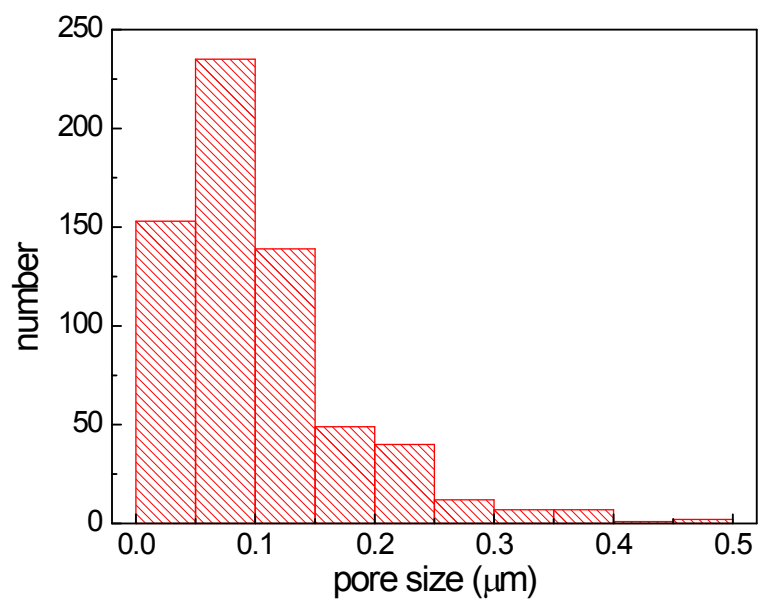
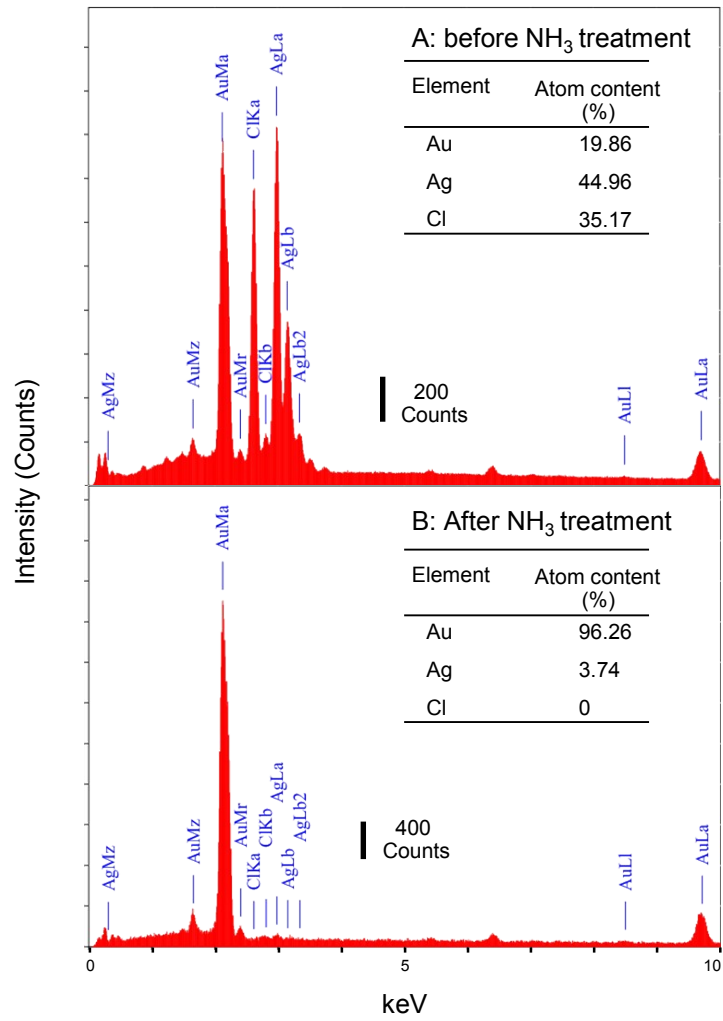Fig. S5   Pore size distribution of the synthesized nano/microporous Au microsheets.

Fig. S6   EDS spectra of Galvanized flakes (A) before and (B) after NH$_3$ treatments.

Table S1. SEM micrographs (back scattering mode) of Galvanized flakes produced with additional NaCl before and after NH$_3$ treatments.
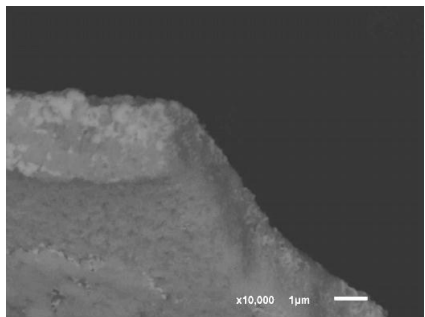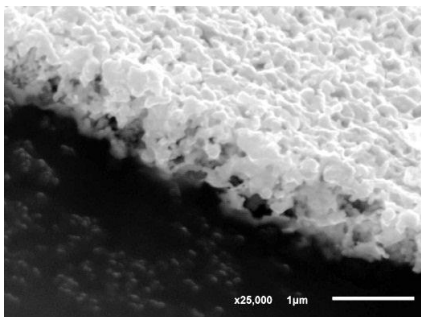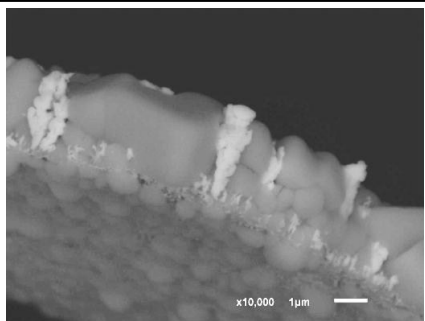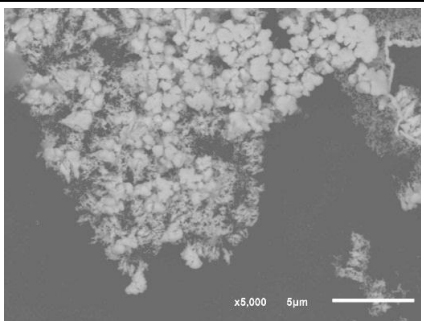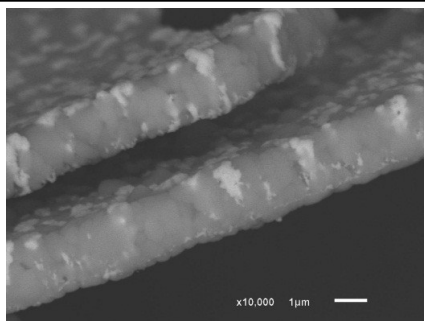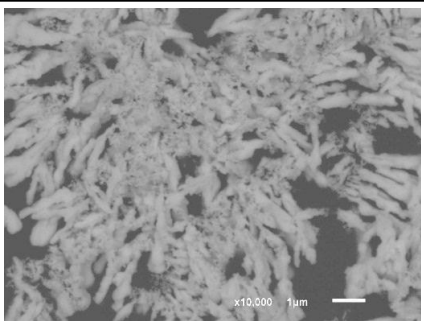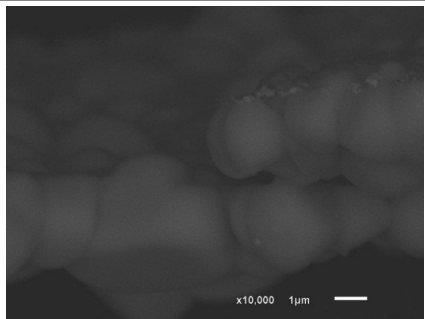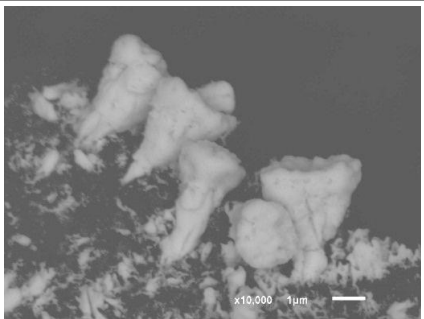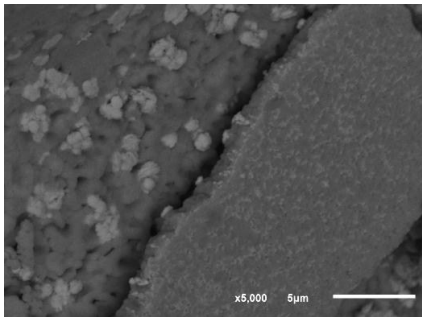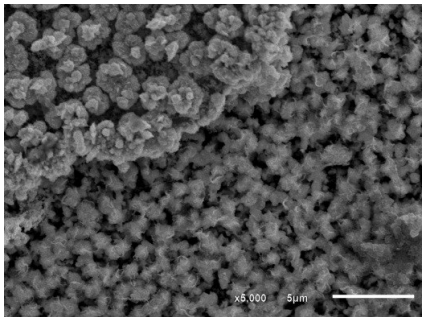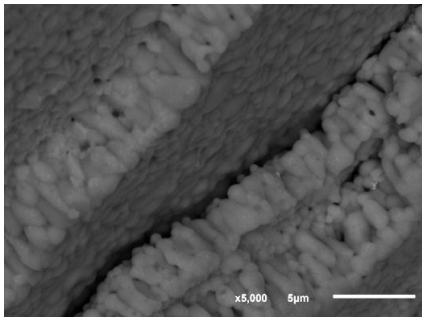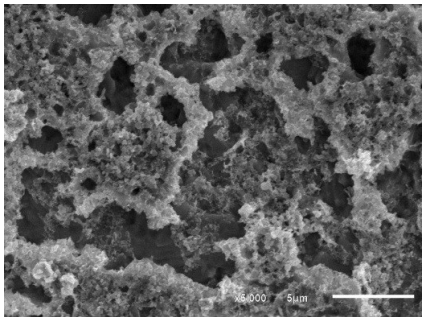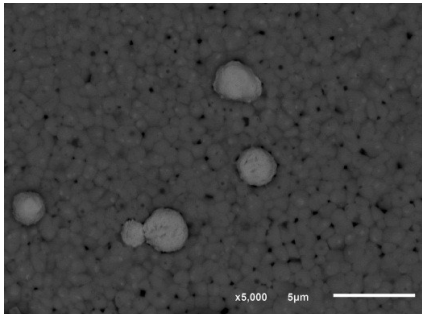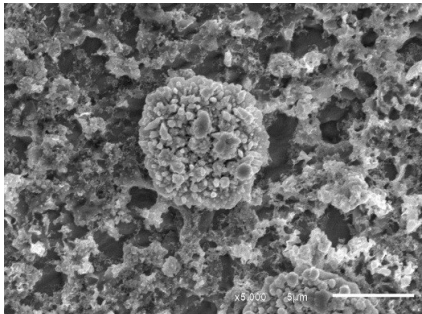
Addition of NaCl	NH$_3$ treatment	
	Before	After
0.0 M		
0.1 M		
0.5 M		
1.0 M		

Table S2. SEM micrographs (back scattering mode) of residual Ag plates in NaCl-added synthesis before and after NH$_3$ treatments.

Addition of NaCl	NH$_3$ treatment	
	Before	After
0.1 M		
0.5 M		
1.0 M		

Fig. S7   SERS and normal Raman spectra of crystal violet (CV).

All spectra in Figure S6 were collected by DXR Raman microspectrometer (from Thermo Scientific) using 50X objective lens with a spot size of ~1 μm. Diode laser of 532-nm excitatio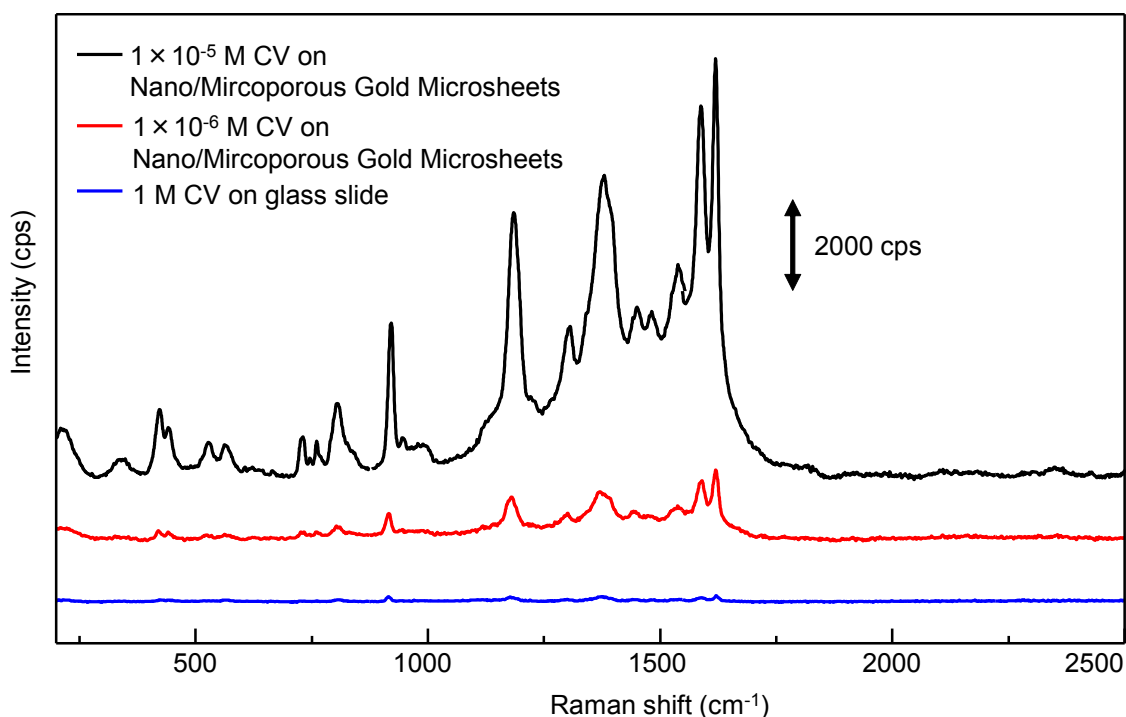n wavelength at 1.0 mW was employed to irradiate a sample. The exposure time was 1 second with 8 exposure numbers. To prepare a sample for SERS measurement, a 5 μL of CV solution with different concentrations was drop-dried on nano/microporous Au microsheets. Normal Raman spectrum was collected from a drop-dried film of 5 μL of 1 M CV solution.

The enhancement factor of a SERS substrate can be calculated using the following equation, $EF = (\frac{I_{SERS}}{I_{Raman}})(\frac{N_{neat}}{N_{ads}})$, where I_{SERS} and I_{Raman} are the integrated intensities of the strongest bands in the SERS spectrum and that of the corresponding bands in the Raman spectrum, respectively, and N_{neat} and N_{ads} are the number of molecules in the cross section of

the laser beam from the drop-casted sample and the number of adsorbed molecules on the gold film in the cross section of the laser beam, respectively. However, it is difficult to measure the roughness of Au microsheets. Then, N_{ads} cannot be determined and EF cannot be calculated using this equation directly. To obtain approximated EF of our synthesized Au microsheets, the roughness of Au microsheets is neglected and the term $\dfrac{N_{neat}}{N_{ads}}$ can be considered as the ratio of concentrations between sample solutions for normal Raman and SERS measurements. The peak at 1181 cm^{-1} was used as reference peak to calculate EF. Therefore, EF of our Au microsheets is {(137774.156 counts)/(2250.345 counts)}×{(1 M)/(10^{-6} M)} = 6.1 × 10^{7}.