Supporting information

Au Nanochain-built 3D Netlike Porous Films Based on Laser Ablation in Water and Eelectrophoretic Deposition

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Experimental Details

Au colloidal solution was prepared by laser ablation of a gold metal target in deionized water, as previously described.[S1-2] A gold plate was fixed on a bracket in a glass vessel filled with 20 mL of deionized water and located 12mm below the water surface. Then it was irradiated or ablated for 60 min by the first harmonic of a Nd:YAG pulsed laser (wavelength 1064 nm, frequency 10 Hz, pulse duration 10 ns) with an energy of 90 mJ/pulse. The laser beam was focused on the plate with a spot size of about 2mm in diameter. The liquid phase was vigorously stirred with a magnetic stirrer during irradiation. After irradiation, we obtained the Au colloidal solution. Au content in the solution was estimated to be about 300 µg/L by measuring the laser ablation induced mass-loss of the gold target.

Two cleaned ITO substrates (35-50 Ω/sq) were used as cathode and anode electrodes, with a distance 3 cm between them and a working area of 1.5 cm × 1 cm, and immersed into the 20 mL Au colloidal solution. EPD was subsequently carried out at a DC voltage of 30 V for 3 h.

After EPD, the samples were rinsed softly by deionized water and dried in the air before structural characterization and morphological observation on field-emission scanning electron microscope (Sirion 200) and transmission electronic microscope (JEM-200CX). XRD

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measurement was conducted on a Philips X'Pert with Cu Kα radiation. Zeta potential was measured by using a Zetasizer 3000 (England, MALVERN). For SERS spectral examination, the samples were first dipped into a solution with 10^{-9} M rhodamine 6G (R6G) for 3 h, rinsed with deionized water to remove unbound R6G molecules, and dried in the air. Raman spectral measurements were carried out on a French LABRAM-HR confocal laser microRaman spectrometer with an air-cooled Ar ion laser at 514.5 nm and a laser beam spot 2 μm. Laser power was 10 mW. The integration time is 5 s for all spectra.

Reference

[S1] N. V. Tarasenko, A. V. Butsen, E. A. Nevar, N. A. Savastenko, *Appl. Surf. Sci.*, 2006, **252**, 4439.

[S2] H. He, W. P. Cai, Y. X. Lin, B. S. Chen, *Langmuir.*, 2010 (Article), DOI: 10.1021/la904723a
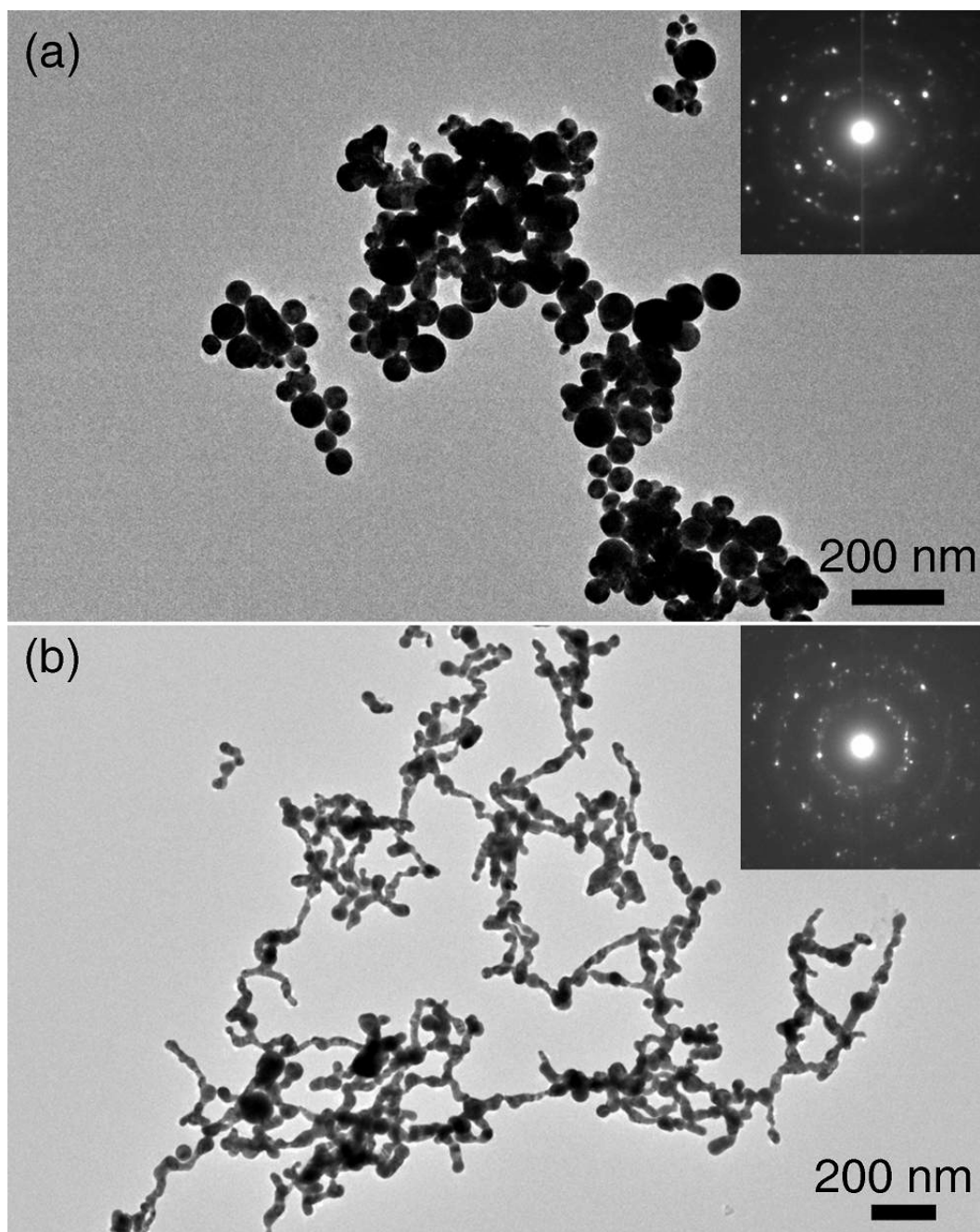
Fig. S1   Hui He et al

Fig. S1. TEM images (low magnification) of Au nanoparticles in the colloidal solution formed by laser ablation of Au target in water, for different times. (a): 20 min, (b): 60 min. Insets: the corresponding SAED patterns.
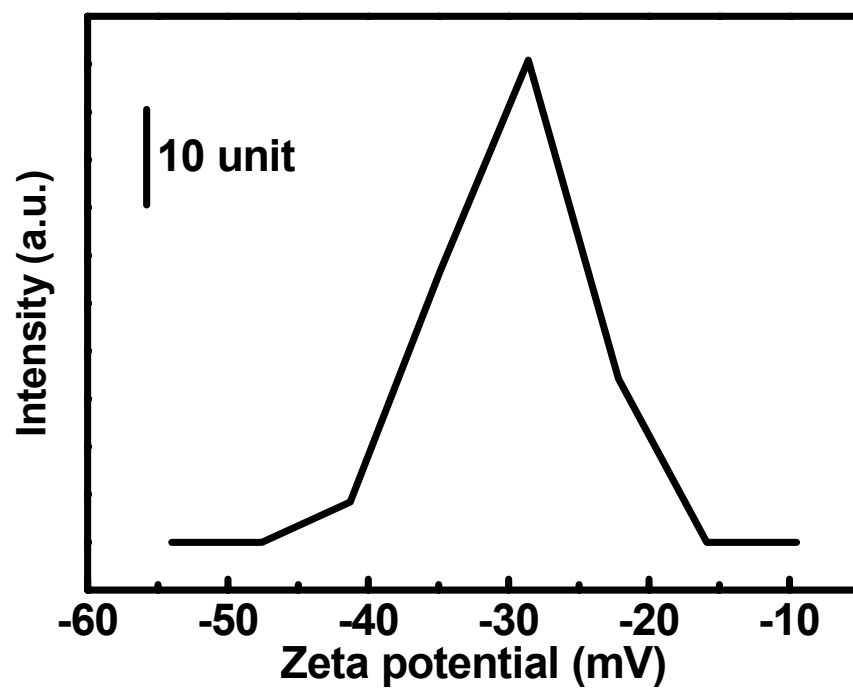
Fig. S2   Hui He et al

Fig. S2. The Zata potential measurements for the Au colloidal solution formed by laser ablation of Au target in water, for 60 min.
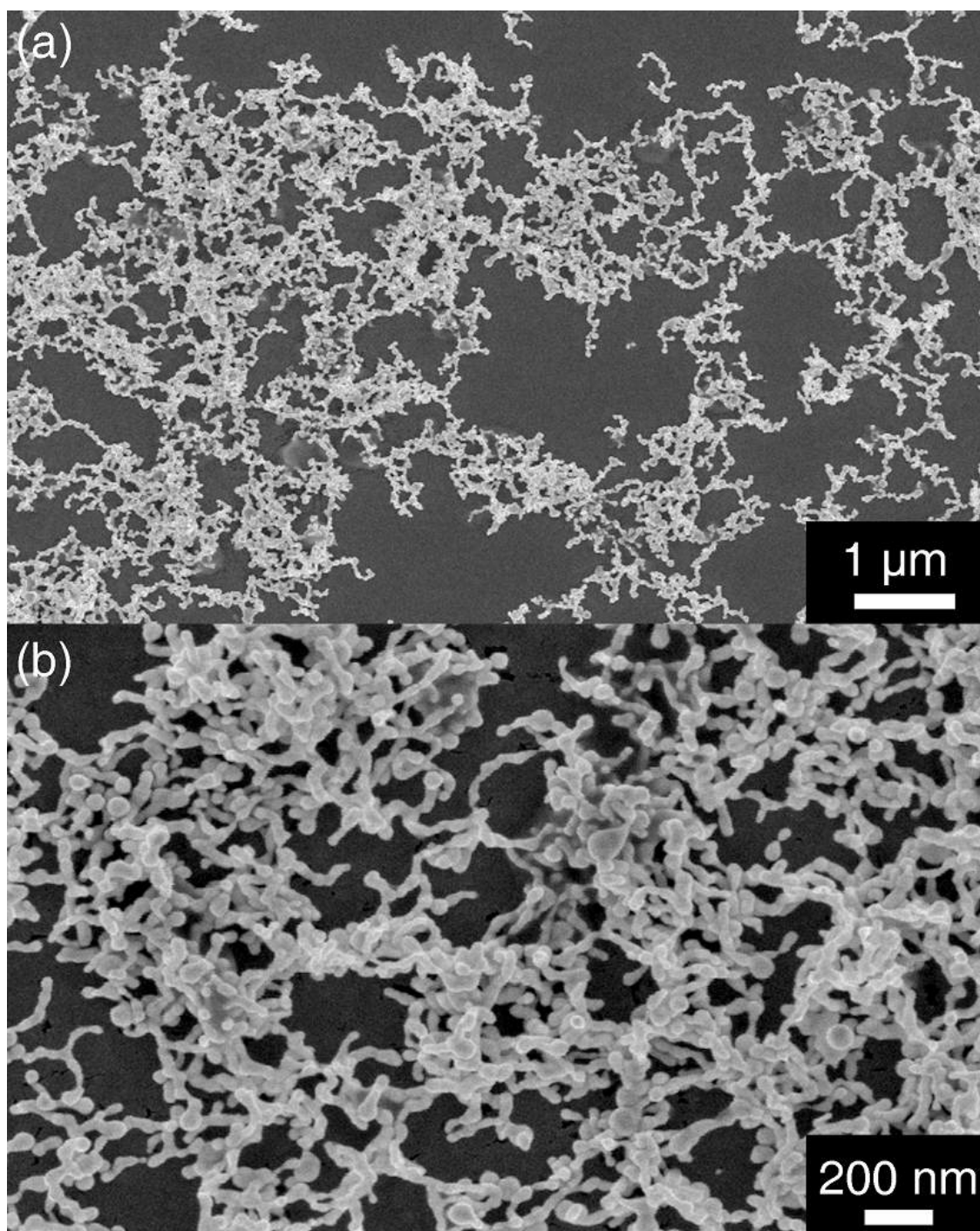
Fig. S3   Hui He et al

Fig. S3. Morphology of the film after EPD at 5 V in the Au colloidal solution shown in Fig.

1b. (a) Low magnification FESEM image , (b): high magnification FESEM image
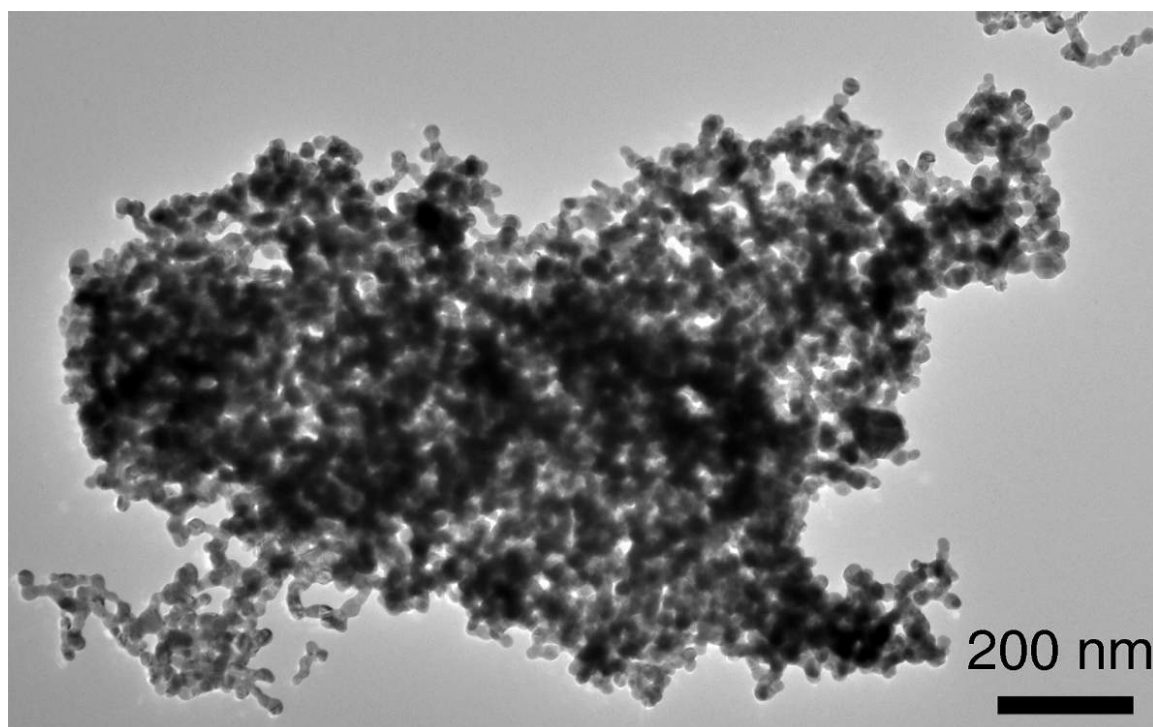
Fig. S4.   Hui He et al

Fig. S4. TEM image of the product scraped from the sample shown in Fig. 3c. The morphology is similar to that shown in Fig. 2d.
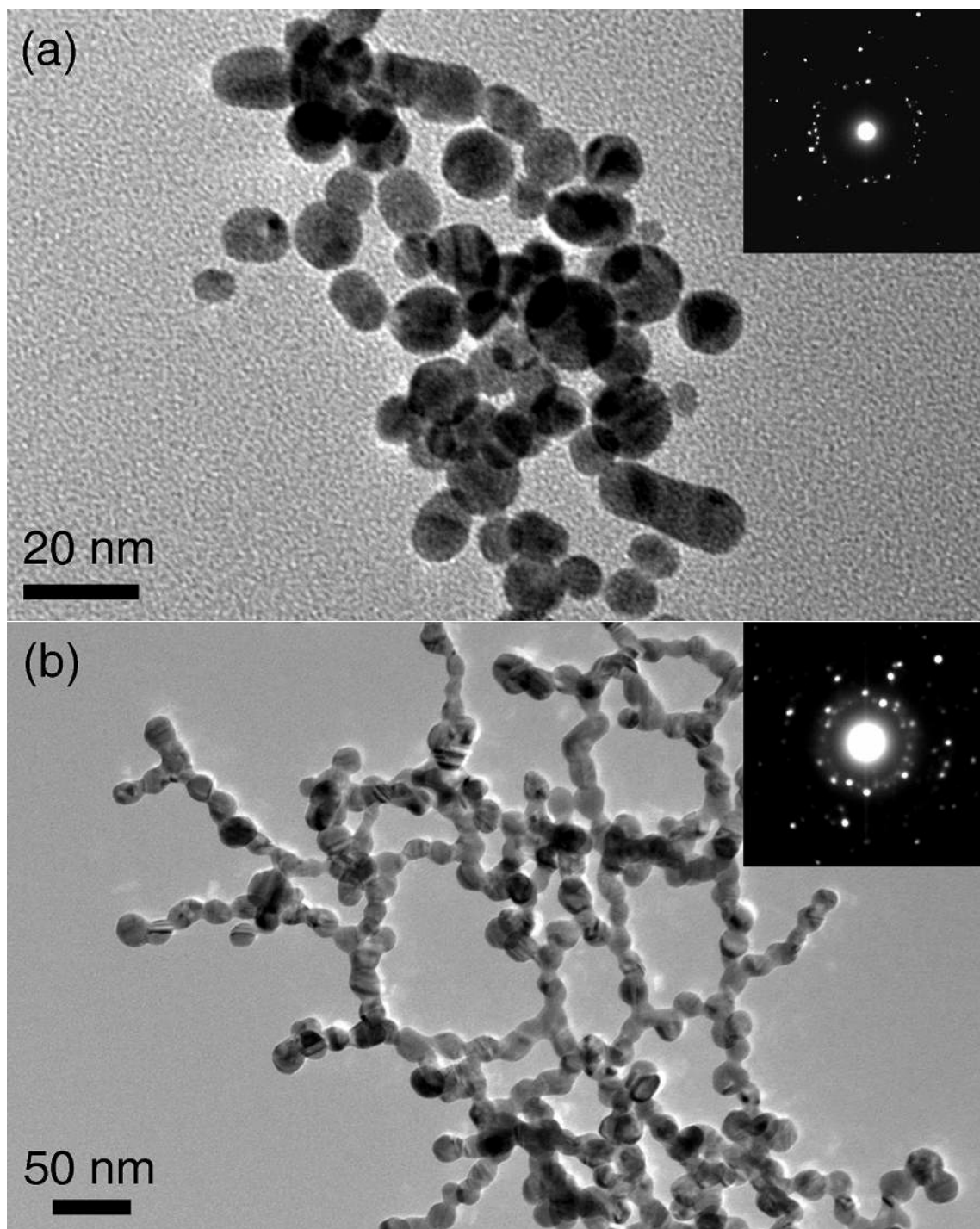
Fig. S5   Hui He et al

Fig. S5. TEM images of Au nanoparticles in the colloidal solution formed by additional laser irradiation, for 90 min, of the colloidal solutions shown in Fig. 1a (a) and b (b), respectively. Insets: the corresponding SAED patterns.
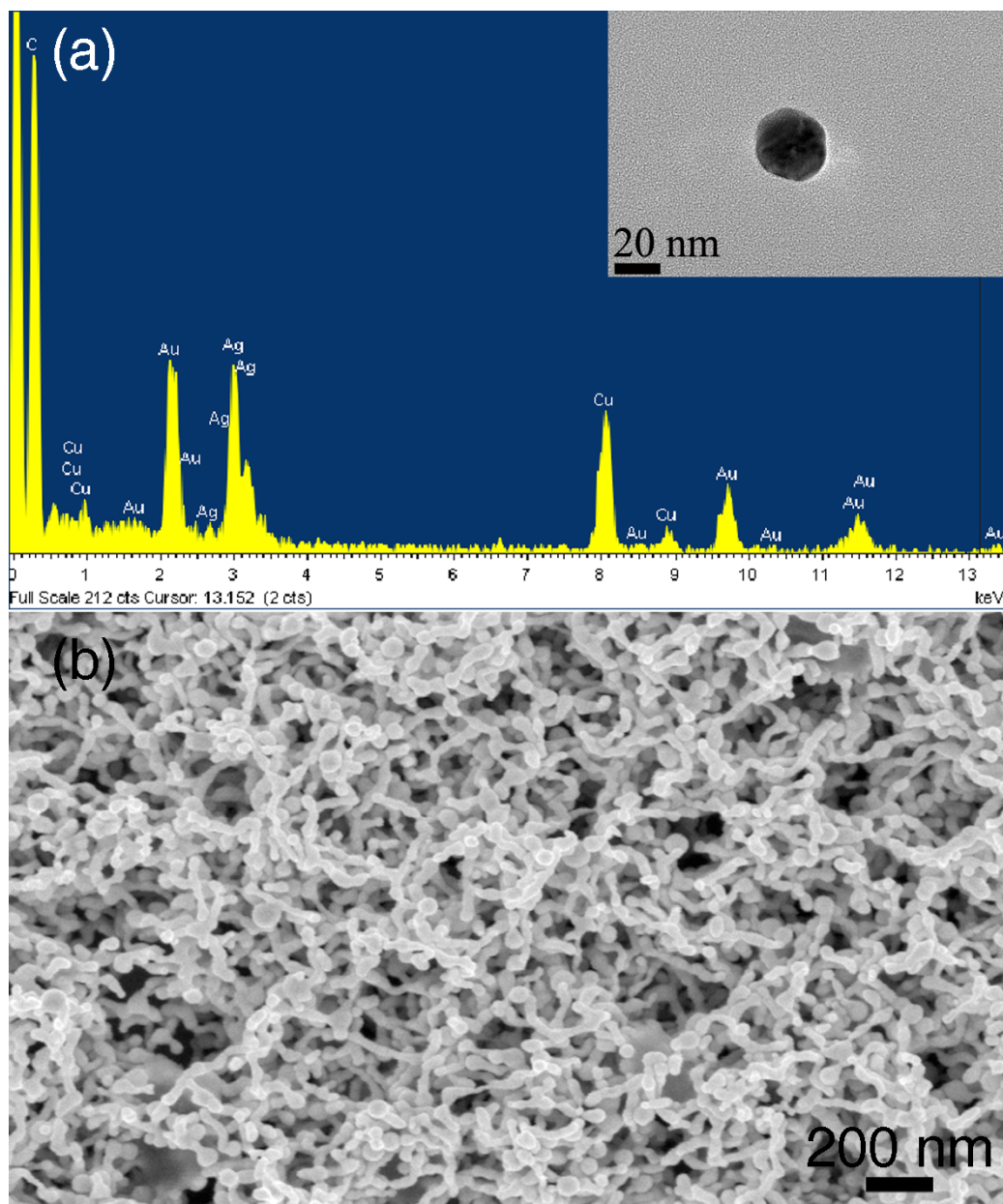
Fig. S6   Hui He et al

Fig. S6. Composition and morphology of Au_1Ag_1 3D netlike film based on laser ablation of Au_1Ag_1 target in water and EPD. (a) EDX spectrum. The inset: TEM image of the corresponding individual nanoparticle (Cu signal is from the copper grid). (b) FESEM image.