Supporting Information for

In-Situ Growth of Au Nanoparticles on the Surfaces of Cu_2O Nanocubes for Chemical Sensors with Enhanced Performances

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1. Experimental Methods

1.1 Materials

$CuCl_2 \cdot 2H_2O$, NaOH, L-ascorbic acid, Chloroauric acid were purchased from Shanghai Chemical Reagent Co. Ltd. and used as received.

1.2 Synthesis of Cu_2O nanocubes: Cu_2O cubes were prepared by a surfactant-free method similar to a previous work.[1] Typically, 0.50 mL of $CuCl_2$ (0.1 M) and 1.5 mL of NaOH (0.2 M) were added into 20 mL distilled water under magnetic stirring. Another solution of L-ascorbic acid (1.0 mL, 0.1 M) was injected into above mixture after it has been kept at room temperature for 5 min under stirring. This resulting mixture was further kept at room temperature for 1 h. Cu_2O cubes were obtained by centrifuging and were washed by distilled water for several times.

1.3 Synthesis of Cu_2O-Au nanocomposites: 1.0 mL (20.0 mg) of as-prepared Cu_2O nanocube colloid solution was injected into chloroauric acid (1.0 mL, 0.1 mM) at room temperature in the presence of ultrasound radiation. The whole reaction was completed within 5 s. And then the nanocomposites were obtained by centrifuging, and were washed with deionized water for several times and finally were dried under vacuum at 50 $^{\circ}$C for 12 h.

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1.4 Characterization

The synthesized Cu_2O nanocubes and the nanocomposites were characterized by X-ray diffraction (XRD, Shimadzu XRD-6000, with high-intensity Cu Ka radiation, wavelength 1.54178 Å), transmission electron microscopy (TEM) and energy-dispersive X-ray (EDX) spectrometry (Tecnai G^2 20 TEM with an acceleration voltage of 200 kV). X-ray photoelectron spectroscopy (XPS) investigation of the nanocomposites was conducted on an ESCALab220-XL electron spectrometer from VG Scientific using a monochromated Al Kα X-ray source (1486.6 eV).

1.5 Gas sensor fabrication and response test

The sensor devices based on Cu_2O nanocubes and Cu_2O-Au nanocomposites were fabricated by a previously reported method.[2] In the synthetic procedure, as-prepared Cu_2O nanocubes and Cu_2O-Au nanocomposites dispersed in ethanol solution were directly coated on the outer surface of an alumina tube-like substrate by a pipette on which a pair of Au electrodes had been printed previously, followed by drying at 60 ◦C for about 2 h. The total amount of Cu_2O or Cu_2O-Au used is about 5 mg. The test was operated in a measuring system of ART-2000A (Art Beijing Science and Technology Development Co. Ltd., PR China). Gas response testing in dry air was measured by a stationary state gas distribution method at a working temperature of 210 ^oC. Target analyte, such as ethanol vapour, was injected into a test chamber and mixed with air. The sensitivity of the sensor in this paper was defined as S = Rg/Ra, where Rg is the resistance in the dry air mixed with detected gases and Ra is that in dry air.

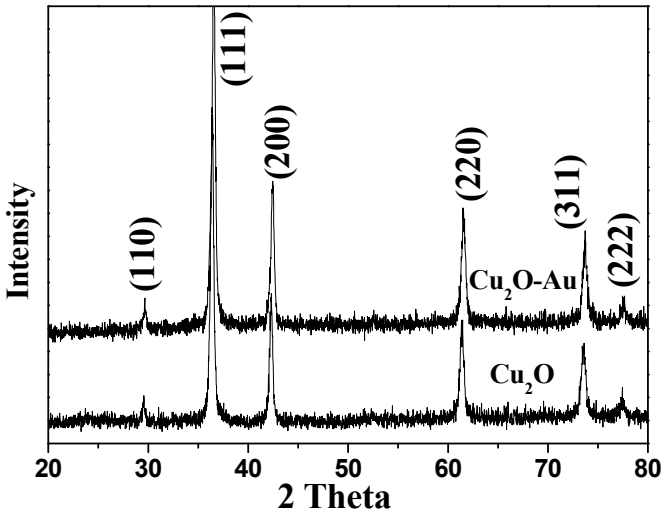

Fig. S1 XRD patterns of Cu_2O nanocubes and as-prepared Cu_2O-Au nanocomposites.

Reference

1. Z. Wang, H. Wang, L. Wang, L. Pan, *J. Phys. Chem. Solids*, 2009, **70**, 719.

2. J. Huang, Y. Wu, C. Gu, M. Zhai, Y. Sun, J. Liu, *Sens. Actuators, B*, 2011, **155**, 126.