Supplementary Material (ESI) for Chemical Communications
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# Electronic Supporting Information

## Fabrication of novel comb-like $Cu_2O$ nanorod-based structures through an interface etching method and their application as ethanol sensors

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**Experimental:**

In a typical procedure, 0.1 g of copper acetate was dissolved in 10 mL of deionized water, then a mixed solvent of 2 mL of salicylaldehyde and 1 mL of methylbenzene was added. The whole solution was transferred into a stainless-steel autoclave lined with poly(tetrafluoroethylene) and maintained at 200 °C for 4 h and then naturally cooled to room temperature. The red floccule at the bottom of the autoclave was collected, washed with absolute ethanol and deionized water for 3 times, and dried in the air.

*Characterizations:* The morphology of the as-prepared samples was observed by a Hitachi S-4800 field-emission scanning electron microscope (FE-SEM) at an acceleration voltage of 10.0 kV. The phase analyses of the samples were performed by X-ray diffraction (XRD) on a SHIMADZU, XRD-6000 with Cu $K_\alpha$ radiation ($\lambda$ = 1.5418 Å). Infrared spectra were carried out using BRUKER TENSOR27 infrared spectrometer.

***Electrochemical Measurements:*** All measurements were conducted at room temperature (25 ± 2 °C). The working electrode was modified as follows: $Cu_2O$ nanostructures were mixed well with 20 μL solvent (5 wt% nafion solution / deionized water = 1:3) and ultrasounded for few seconds for better dispersion. Then, 10 μL such solution was dropped onto the surface of a glassy carbon electrode (r = 3 mm), left for dry in the air for 1h. Various concentrations of ethanol were injected into 0.1 M sodium hydroxide solution. The whole test was carried out using a computer-controlled RST-5300 electrochemical station (Zhengzhou Shiruisi technology Co., Ltd.) A three electrode configuration is utilized with Ag/AgCl (saturate KCl) as reference electrode, Pt as auxiliary electrode and glassy carbon electrode as working electrode.

***Gas-sensing Test:*** $Cu_2O$ nanostructures and commercial $Cu_2O$ powder were mixed with a bit of ethanol to form $Cu_2O$ pastes in a glass beaker. The $Cu_2O$ pastes were then brush-coated onto the surface of an $Al_2O_3$ microtube with four Pt electrodes. The coating process was repeated several times to form a complete coating. The $Cu_2O$-coated $Al_2O_3$ microtube was then welded on to a special pedestal with six poles by solder paste. A heating coil was then inserted through the $Al_2O_3$ microtube and its two ends were welded to the other two poles of the pedestal.

The ethanol-sensing properties of $Cu_2O$ sensors were measured using JF02E gas sensor test system of Kunming Guiyan Jinfeng technology Co. LTD. The sensors were infixed into an air chamber with 10 inlet sites. Different concentrations of ethanol vapors (100-1000 ppm) were used as the target gas to test the sensing performance of $Cu_2O$ nanostructures and commercial powder.

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The operating temperatures were 300 ~ 400 °C, controlled by an electric heating system (applied voltages: 3.0 ~ 5.0 V).

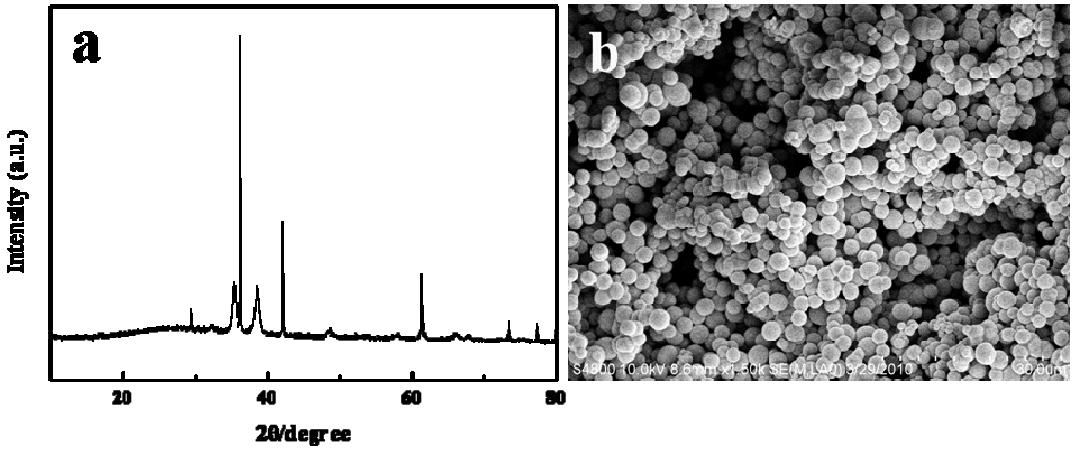


Fig. SI1 (a) XRD pattern and (b) SEM image of the sample prepared without the addition of salicylaldehyde.

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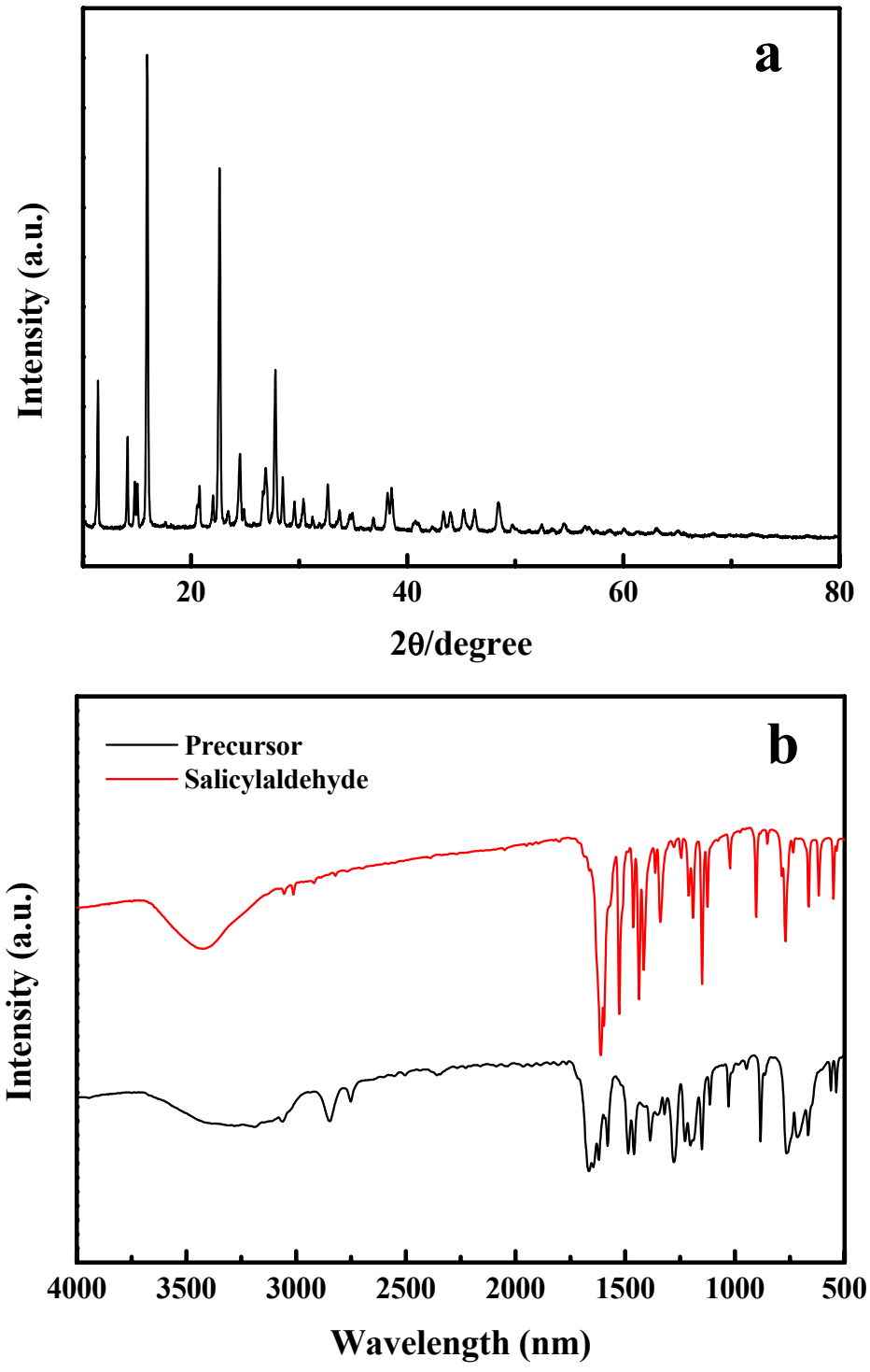


Fig. SI2 (a) XRD pattern of the precursor; (b) IR spectra of the precursor and salicylaldehyde.

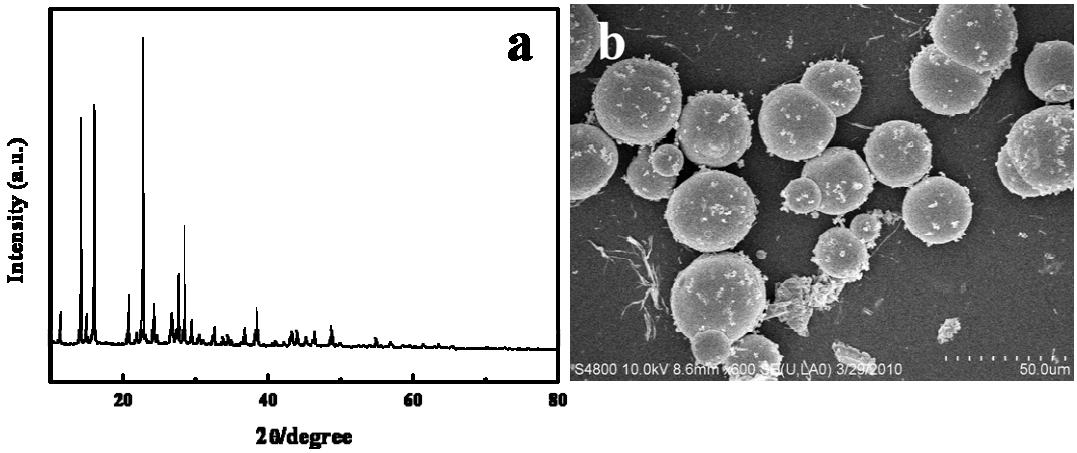


Fig. SI3 (a) XRD pattern and (b) SEM image of the product that prepared with 0.1 g of copper acetate, 2 ml of salicylaldehyde and 1 ml of toluene at 200 °C for 4 h,