Supporting Information:

Glucose-Assisted Synthesis of Copper Micropuzzles and Their Application as Nonenzymatic Glucose Sensors

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Experimental:

Synthesis of the copper micropuzzles: In the experiments, various puzzle Cu structures were prepared by the reduction of $CuSO_4 \cdot 5H_2O$ with glucose through a mild hydrothermal process. In a typical procedure, the starting solution was prepared by mixing 0.10 g of glucose and 0.16 g of $CuSO_4 \cdot 5H_2O$ in 10 mL of H_2O, and the resulting solution was transferred into 50 mL stainless-steel autoclaves lined with poly(tetrafluoroethylene) (PTFE, Telfon). The autoclave was sealed and maintained at 160 °C for 8 h and then cooled to room temperature. The red products obtained at the bottom of the autoclave were collected, washed three times with deionized water, and dried in air.

Electrochemical Measurements: All measurements were conducted at room temperature (25± 2 °C). The modified electrode was prepared as follows: 0.001 g of Cu nanostructures or commercial Cu powders was mixed well with 100 μL of 0.5 % nafion solution. Then, the 10 μL of the solution was dropped onto the surface of glassy carbon electrode (r = 3 mm), left for dry for 1h. Various concentrations of D-(+) glucose or other agents were injected into 0.1 M phosphate buffer at pH= 7.40. Currents at different glucose concentrations were recorded after the transient steady states reached with constant stirring. CHI660c electrochemical workstation (CHI Co., Shanghai, China) is used for all electrochemical analysis. 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.

Antibacterial test: The antibacterial activity of the synthesized microstructures was tested against Staphylococcus aureus. The micropuzzles were mixed with molten LB-agar at 20 μg/mL. Serial dilution ($1/10^4$) of late log phase bacteria (OD_{600}= 2.0) were then plated onto solidified copper microcrystals agar plates and incubated at 37 °C for 24 h.

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_α radiation (λ = 1.5418 Å).

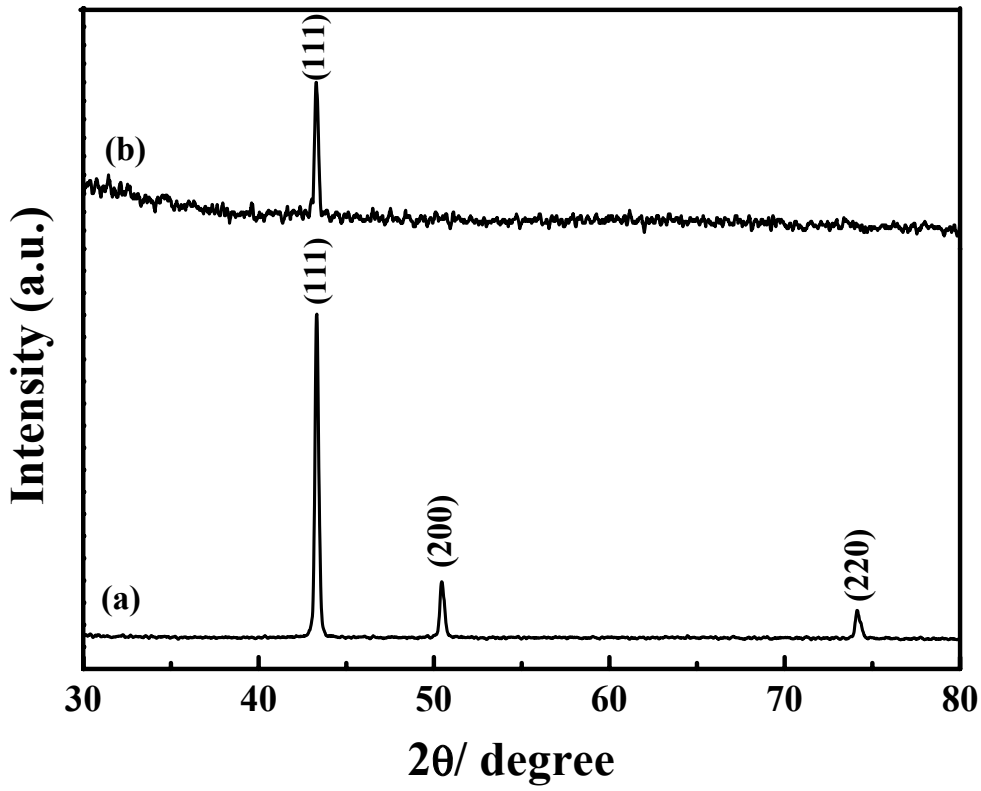

Figure SI1 XRD patterns of the as-prepared puzzle-like Cu structures: (a) powder XRD pattern; (b) XRD pattern of a single puzzle-like Cu plate.

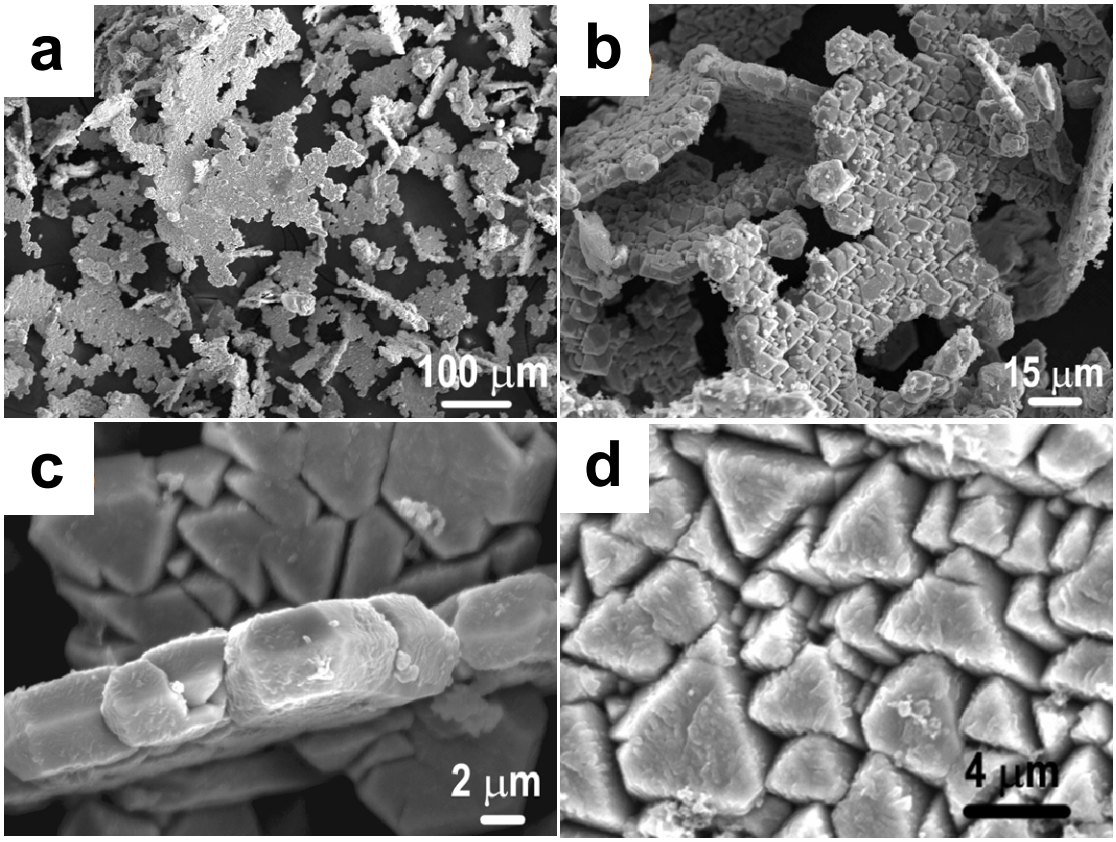

Figure SI2: SEM images of the sample prepared with $CuSO_4 \cdot 5H_2O$ (0.08 g) and glucose (0.1 g) and distilled water (10 mL) as reactant under 160 °C hydrothermal conditions for 12 h.

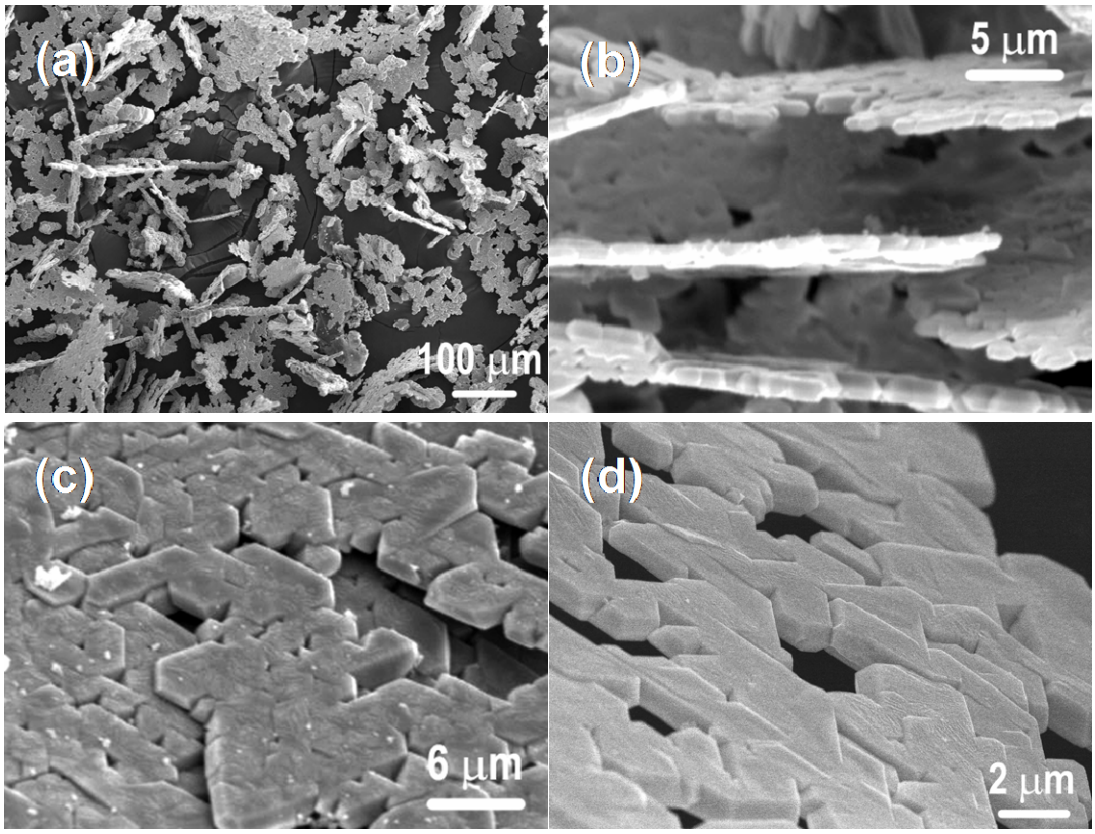

Figure SI3 SEM images of the products that were prepared under different conditions: (a~c) SEM images with different magnification of the sample prepared with $CuSO_4 \cdot 5H_2O$ (0.06 g) and glucose (0.05 g) and distilled water (10 ml) as reactant under 160 °C hydrothermal conditions for 16 h; (d) An SEM image of the sample prepared with $CuSO_4 \cdot 5H_2O$ (0.16 g) and glucose (0.05 g) and distilled water (10 ml) as reactant under 160 °C hydrothermal conditions for 16 h. All these figures confirm that under these conditions puzzle-like structured Cu could be synthesized.

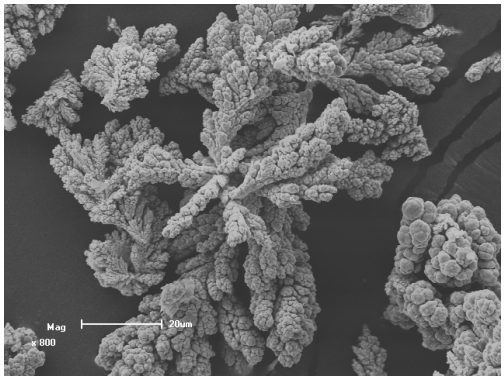

Figure SI4 An SEM image of commercial copper particles

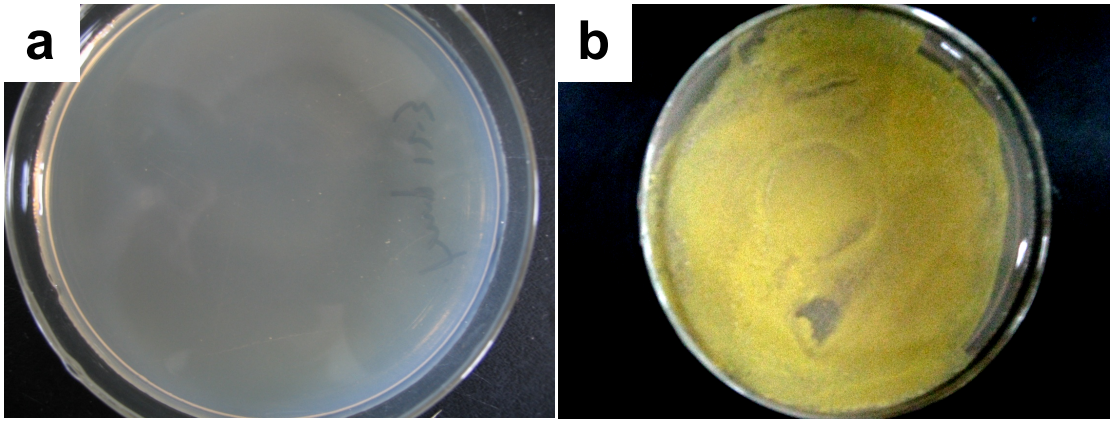

Figure SI5. Photos of the LB-agar plate: (a) before the incubation of the bacterial; (b) after the incubation with the addition of commercial copper powders.