

Electronic Supplementary Information

## Nanoparticle-aggregated CuO nanoellipsoids for high performance non-enzymatic glucose detection

Xiaozhe Zhang, Shaodong Sun, Jian Lv, Linli Tang, Chuncai Kong, Xiaoping Song and Zhimao Yang\*

*School of Science, State Key Laboratory for Mechanical Behavior of Materials, Collaborative Innovation Center of Suzhou Nano Science and Technology, Xi'an Jiaotong University, Xi'an 710049, ShaanXi, People's Republic of China.*

E-mail: zmyang@mail.xjtu.edu.cn

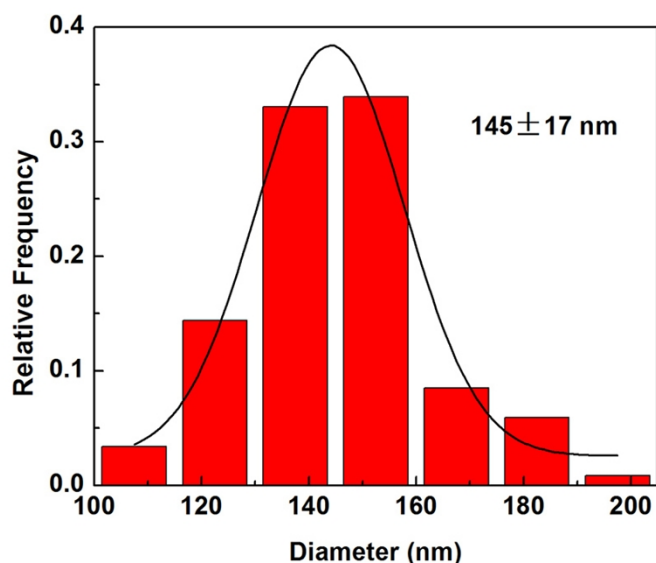


Fig. S1 Size distribution diagram of the width along the longest axis of the CuO nanoellipsoids.

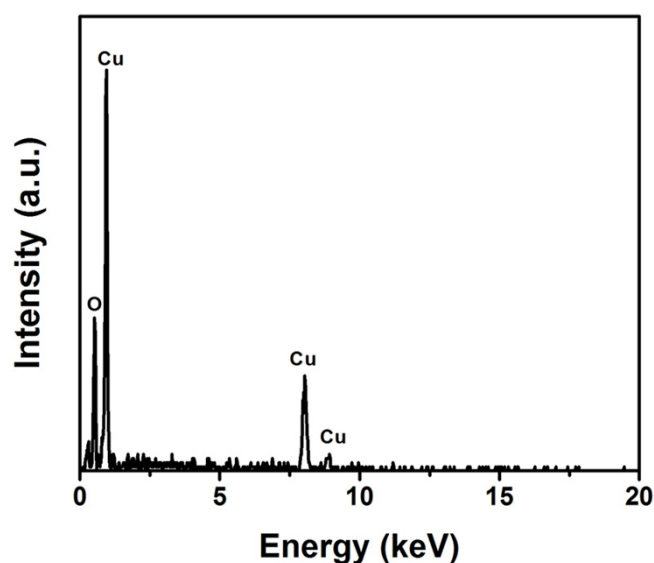
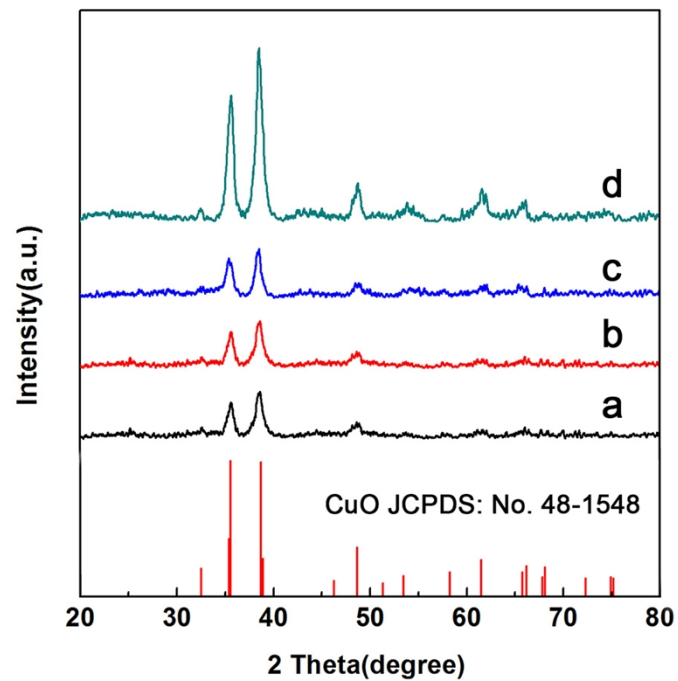
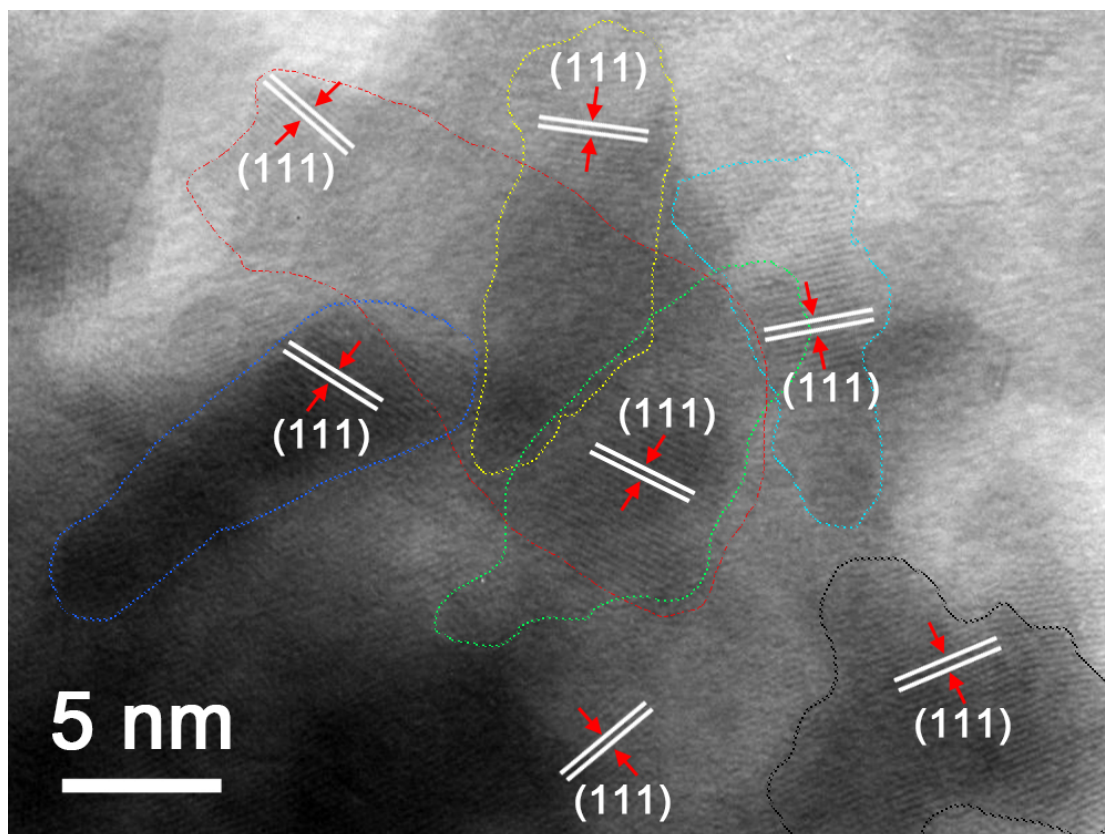


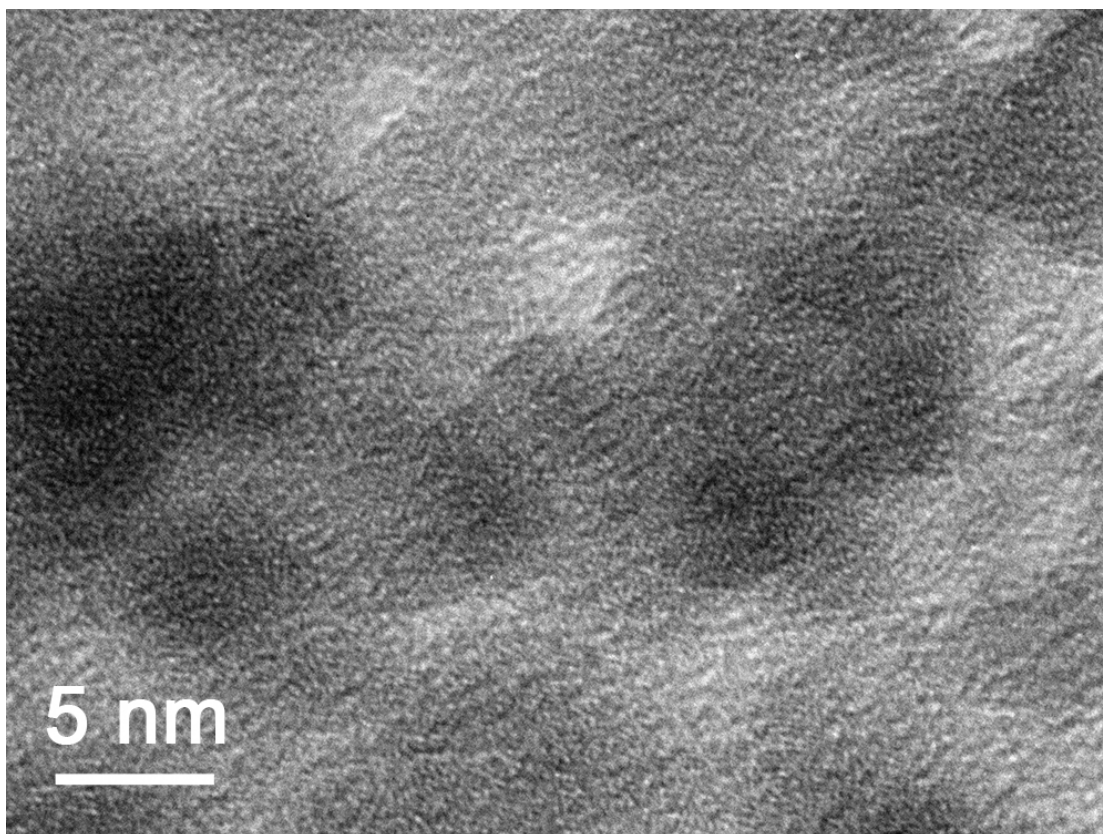
Fig. S2 EDX spectrum of the as-prepared CuO nanoellipsoids.



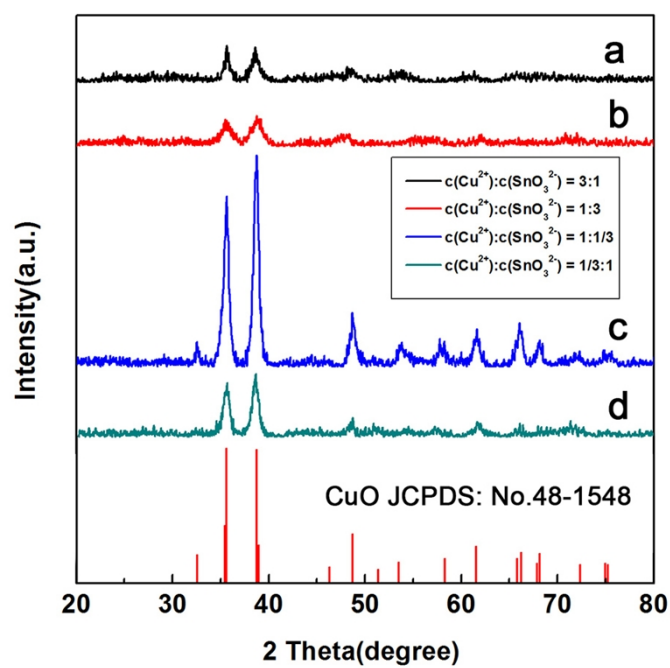
**Fig. S3** XRD patterns of the products obtained at different reaction time: (a) 1 min, (b) 2 min, (c) 5 min, (d) 10 min



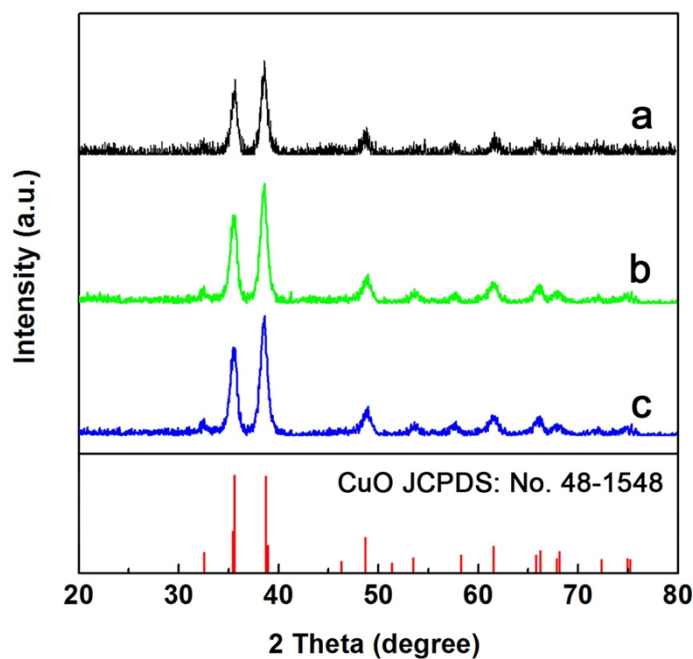
**Fig. S4** HRTEM image of the CuO nanoparticle obtained at  $V_{\text{NaOH}} = 3\text{mL}$  (reaction time: 1 min).



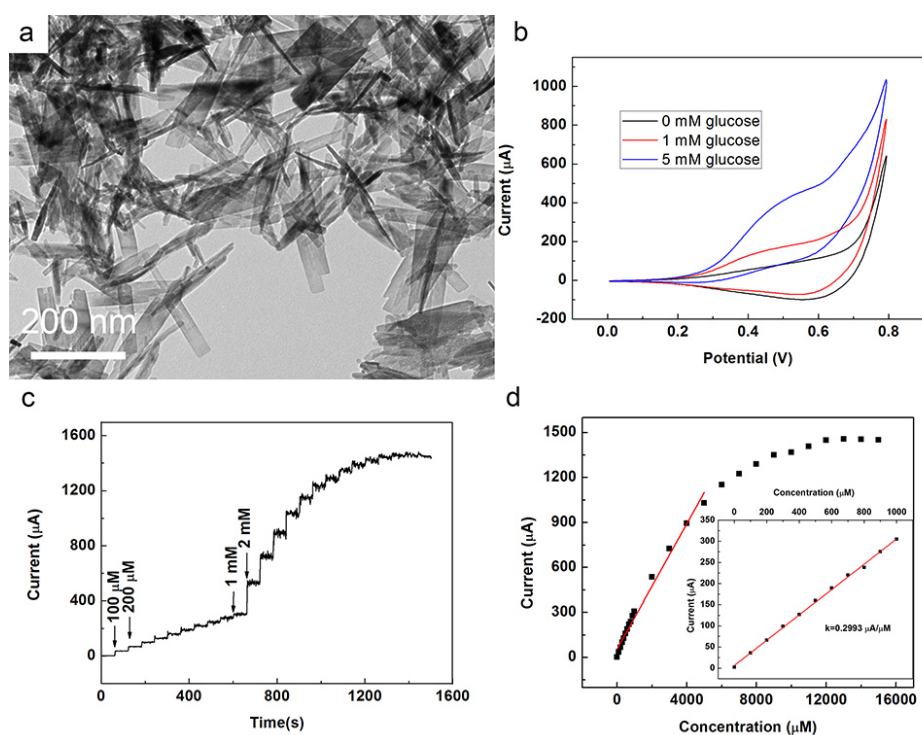
**Fig. S5** HRTEM image of the precursor nanoparticle obtained at  $V_{\text{NaOH}} = 3\text{mL}$  (reaction time: 1min).



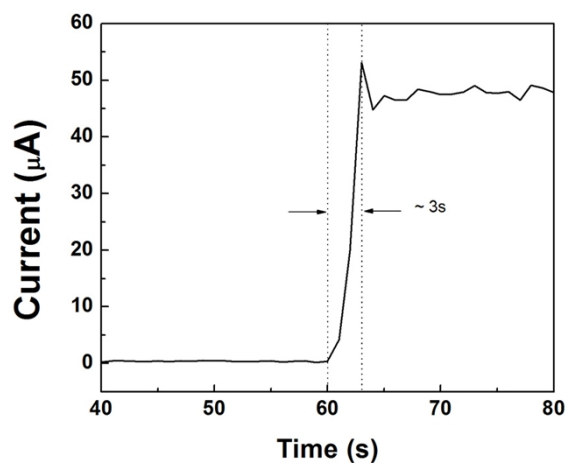
**Fig. S6** XRD patterns of the products obtained at different molar ratio of  $\text{Cu}^{2+} : \text{SnO}_3^{2-}$  (a) Sample A, (b) Sample B, (c) Sample C, (d) Sample D.



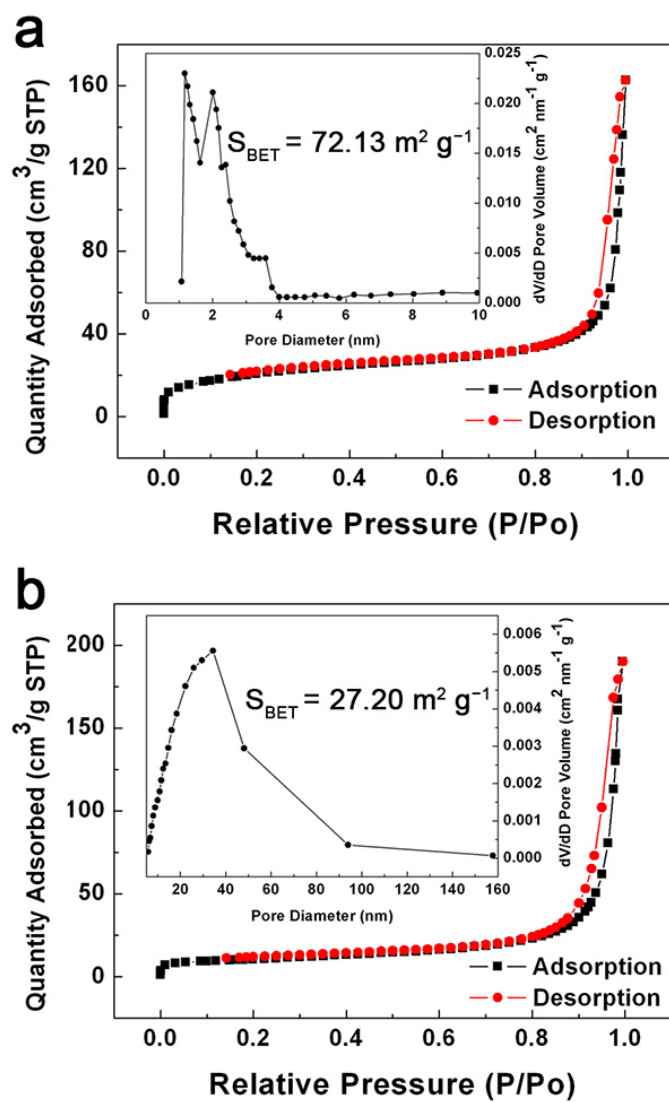
**Fig. S7** XRD patterns of the products obtained at different NaOH: (a) Sample E, (b) Sample F, (c) Sample G.



**Fig. S8** (a) TEM images of the product synthesized in the absence of  $\text{Na}_2\text{SnO}_3$ . (b) CVs sweep curves for CuO nanoplates modified electrode in the presence of glucose concentrations between at 0 mM (black line), 1 mM (red-line) and 5 mM (blue-line) in 100 mM KOH at scan rate of  $50 \text{ mV s}^{-1}$ . (c) Amperometric response of the CuO nanoplates modified electrode with successive addition of glucose to the 100 mM KOH solution at regular intervals. The applied potential was +0.55 V (vs. Ag/AgCl (sat'd KCl) reference). (d) Corresponding calibration curve of the CuO glucose sensor, Inset is a linear regression of low glucose concentration (0.1mM ~ 1mM).



**Fig. S9** Time-current response of the CuO nanoellipsoids modified glucose sensor.



**Fig. S10** Typical nitrogen gas adsorption-desorption isotherms and pore size distribution curves (insets) of the CuO nanostructure: (a) nanoellipsoids (b) nanoplates.

**Table S1** Detailed experimental conditions of the products

| Sample | CuSO <sub>4</sub><br>(mmol) | Na <sub>2</sub> SnO <sub>3</sub><br>(mmol) | NaOH<br>(mmol) |
|--------|-----------------------------|--|----------------|
| A      | 3.6                         | 1.2  | 7.5            |
| B      | 1.2                         | 3.6  | 7.5            |
| C      | 1.2                         | 0.4  | 7.5            |
| D      | 0.4                         | 1.2  | 7.5            |
| E      | 1.2                         | 1.2  | 12.5           |
| F      | 1.2                         | 1.2  | 25             |
| G      | 1.2                         | 1.2  | 37.5           |

**Table S2** Comparison of the key performance characteristics of some of existing catalysts for enzyme-free electrooxidation of glucose.

| Electrodes                | Potential<br>(V) | Sensitivity<br>( $\mu\text{A mM}^{-1} \text{cm}^{-2}$ ) | Linear range<br>(mM) | LOD<br>( $\mu\text{M}$ ) | Reference           |
|---------------------------|------------------|---|----------------------|--------------------------|---------------------|
| CuO nanourchins           | +0.5             | 2682  | 0.1 ~ 3              | 1.52                     | 14                  |
| CuO nanoflowers           | +0.5             | 2657  | 0.01 ~ 5             | 1.71                     | 22                  |
| CuO nanourchins           | +0.5             | 1634  | up to 5              | 1.97                     | 26                  |
| CuO nanocubes-graphene    | +0.59            | 1360  | 2 ~ 4                | 0.7                      | 37                  |
| Cu <sub>x</sub> O/Cu      | +0.5             | 1620  | up to 4.0            | 49                       | 38                  |
| CuO nanoleaf/MCNTs        | +0.35            | 664.3   | 0.9                  | 5.7                      | 39                  |
| CuO/MWCNTs                | +0.7             | 2190  | 3                    | 0.8                      | 40                  |
| <b>CuO nanoellipsoids</b> | <b>+0.55</b>     | <b>2555</b>   | <b>0.1 ~ 3</b>       | <b>0.072</b>             | <b>Current work</b> |