Supporting information

Controllable Synthesis of Hollow Pumpkin-like CuO/Cu$_2$O Composites for Ultrasensitive Non-enzymatic Glucose and Hydrogen Peroxide Biosensors

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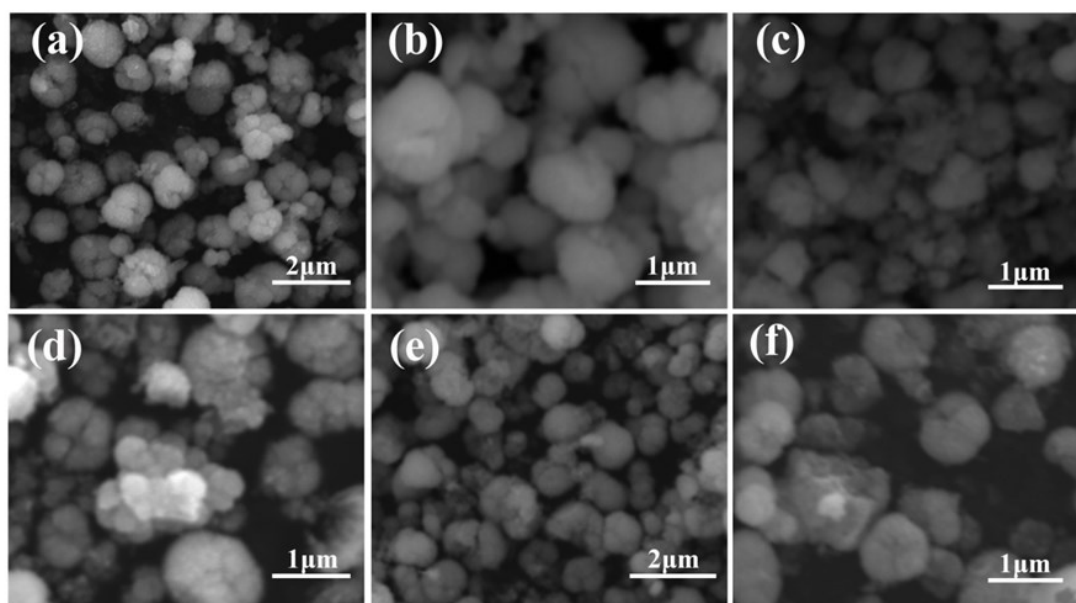
Fig. S1. Materials characterization. SEM images of pumpkin-like CuO/Cu$_2$O composites obtained at 150 ℃ for (a) 9, (b) 12, (c) 18, (d) 24, (e) 30 and (f) 36 h.
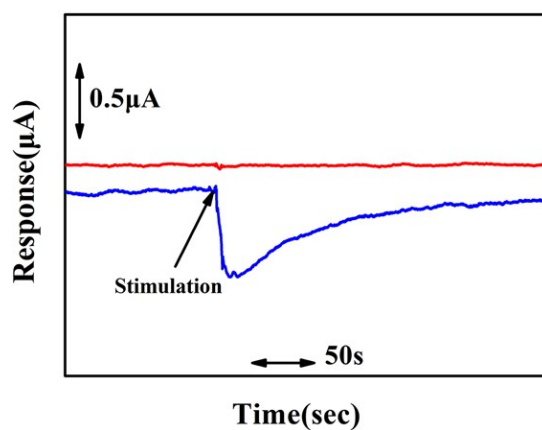
Fig. S2. Amperometric responses of modified electrode with the addition of stimulated agents in PBS solution with and without cells.

Table S1. Effect of reaction times on the phase composition of the CuO/Cu$_2$O composites.

Samples	9h	12h	18h	24h	30h	36h
$W_{CuO}(\%)$	100	89.8	83.0	69.6	43.0	33.2
$W_{Cu2O}(\%)$	0	7.2	17.0	30.4	57.0	66.8

Table S2. Performance comparison of reported glucose sensors based on the composition of CuO and Cu_2O.

Materials	Electrolyte	Sensitivity ($\mu A\ mM^{-1}\ cm^{-2}$)	Detection limit (μM)	Linear range (mM)	Reference
Cu_xO/Cu	0.1M K	1620	49	Up to 6	[1]
CuO/Cu_2O NFs	0.1M NaOH	830	0.7	Up to 10	[2]
$Cu/Cu_2O/CuO$ HSs	0.1M NaOH	8726	0.39	0.0005 -30	[3]
$CuO/Cu_2O@CuO/Cu_2O$ core-shell NWAs	0.1M NaOH	10090	0.48	0.00099-1.33	[4]
$CuO/rGO/Cu_2O/Cu$	0.1M NaOH	3401	0.1	0.0005-8.266	[5]
Cu_xO nanosheets/Cu	0.1M NaOH	1541	0.57	Up to 4	[6]
CuO/Cu_2O nanowires	0.075M NaOH	1281	16.7	0.05-2.0	[7]
$Cu_xO/PPy/Au$	0.1M NaOH	232	6.2	Up to 8	[8]
$Cu/Cu_xO/NC$	0.1M NaOH	—	3.5	0-2.0; 2.0-5.0	[9]
Cu_xO/Cu	0.5M NaOH	4848	—	0.01-0.2;0.5-1.6	[10]
$CuO/\ Cu_2O$ composite	0.1M NaOH	880	0.108	Up to 15	This work

Table S3. Comparison of various sensors based on CuO and Cu_2O for H_2O_2 detection.

Materials	Electrolyte	Sensitivity ($\mu A\ mM^{-1}\ cm^{-2}$)	Detection limit (μM)	Linear range (mM)	Reference
$CuO/rGO/Cu_2O/Cu$	0.1M PBS	3401.1	0.1	0.0005-8.266	[5]
$CuO@Cu_2O–NWs/PVA$	PBS(PH=7)	39.5	0.35	0.001-10	[11]
$Cu_2O/CuO@rGO$	0.1M NaOH	431.65	0.71	0.0015–11	[12]
Cu_xO NPs@ZIF-8	0.1M NaOH	178	0.15	0.0015−21.4	[13]
Cu_xONPs/GF	PBS(pH=7.15)	3437.5	0.023	0.07-133	[14]
$CuO/\ Cu_2O$ composite	0.01M PBS	5154	0.018	0.005-1.05	This work

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