Electronic Supplementary Material (ESI) for RSC Advances
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Supplementary Information

One-Pot Alkaline Vapor Oxidation Synthesis and Electrocatalytic Activity towards Glucose Oxidation of CuO Nanobelt Arrays

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Experimental details

Characterization.

Field-emission scanning electron microscopy (SEM) was performed using Hitachi S-4800 type II (accelerating voltage, 10 kV). X-ray diffraction (XRD) was performed using Rigaku RINT 2500 using Cu Kα radiation. ICP-AES measurement was performed using SHIMADZU ICP-7500.

Electrochemical Measurements.

Electrochemical measurements were performed on an HZ-5000 with HAG-1512m (HOKUTO DENKO). All electrochemical experiments were carried out using a conventional three-electrode system consisting of an Ag/AgCl (saturated KCl) reference electrode, a platinum wire counter electrode, and a CuO nanobelt arrays/Cu electrode (formation conditions; 100 mM NH_3−100 mM H_2O_2 aqueous solution, 80 °C, 7h). A 0.5 mol L-1 NaOG aqueous solution was used as the supporting electrolyte. The electrolyte was stirring during the electrochemical measurement using a magnetic stirrer and a stirring bar.

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Fig. S1

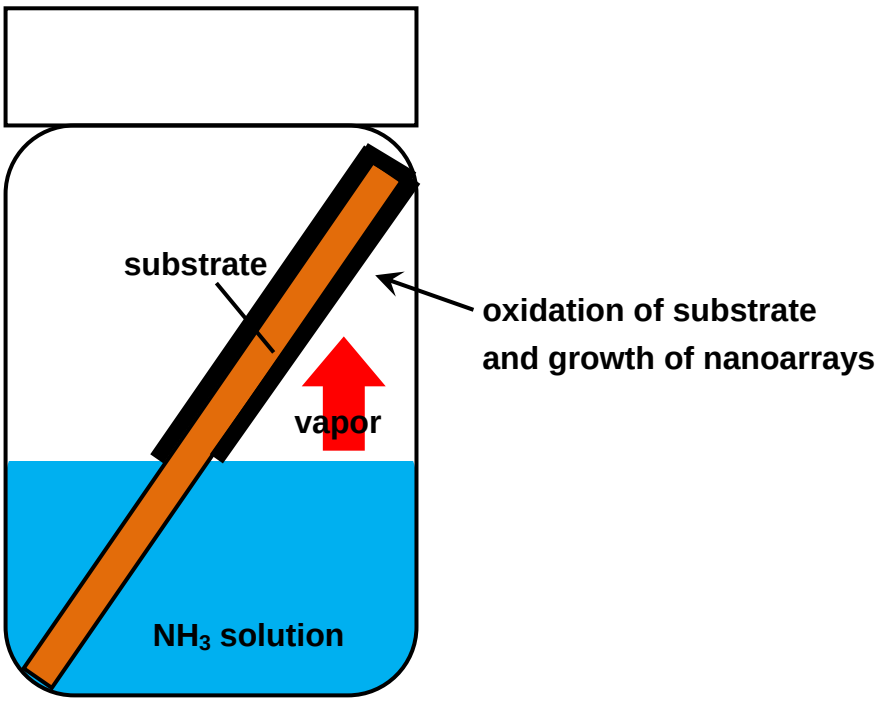

Fig. S1 The schematic illustration of a vapor oxidation (VO) growth process.

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Fig. S2

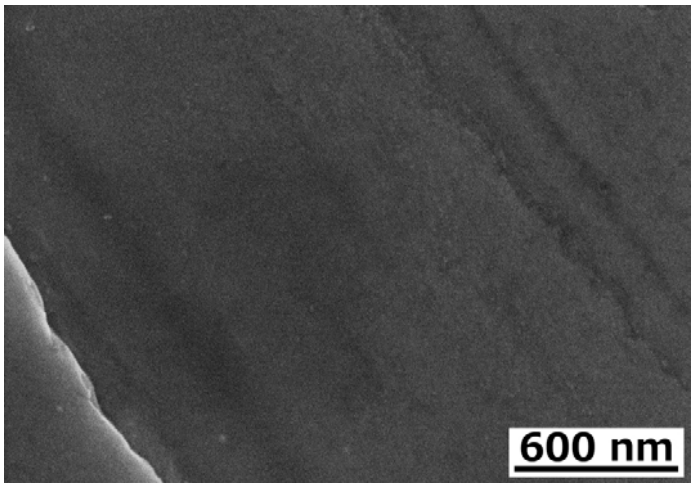

Fig. S2 An SEM image of Cu plate before the VO reaction.

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Fig. S3

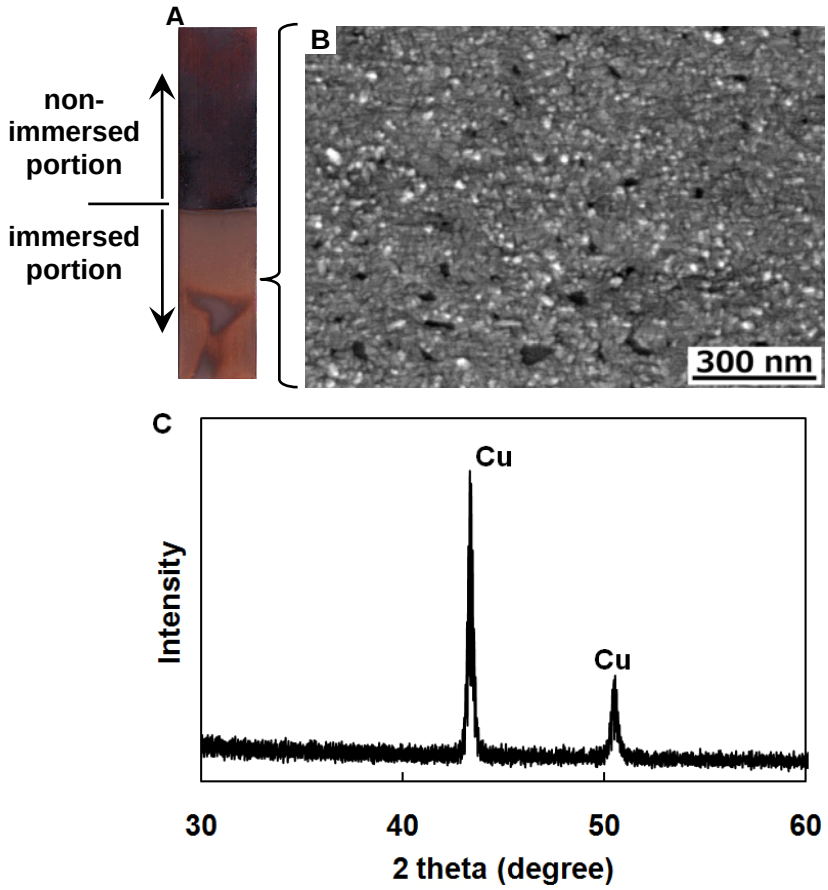

Fig. S3 (A) A Picture of a Cu plate after the VO reaction (100 mM NH_3−100 mM H_2O_2 aqueous solution). An SEM image (B) and XRD pattern (C) of Cu plate at the immersed portion.

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Fig. S4

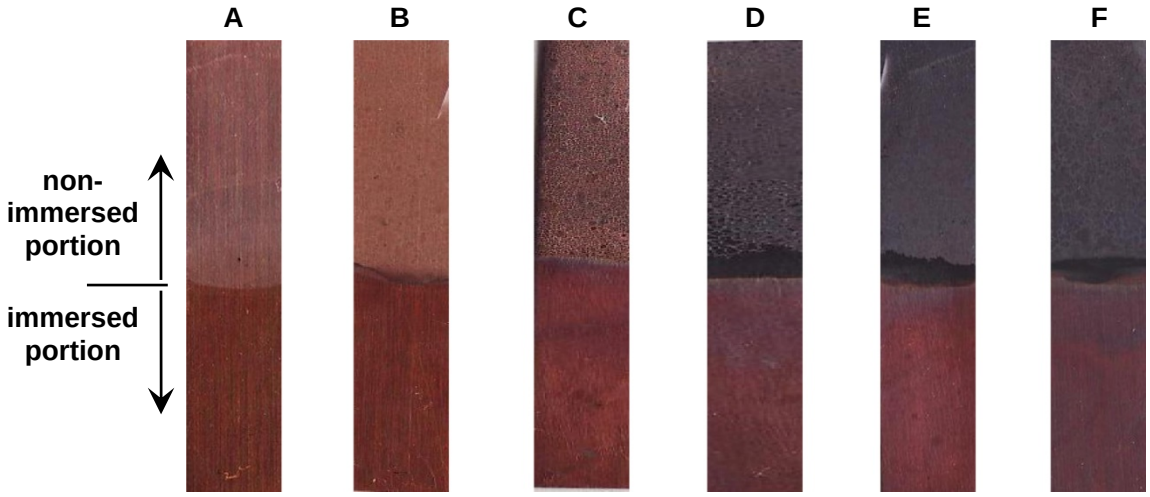

Fig. S4 Pictures of Cu substrates after the VO reaction: (A), 10min; (B), 30min; (C), 1h; (D), 3h; (E), 7h; (F), 10h. 100 mM NH_3−100 mM H_2O_2 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S5

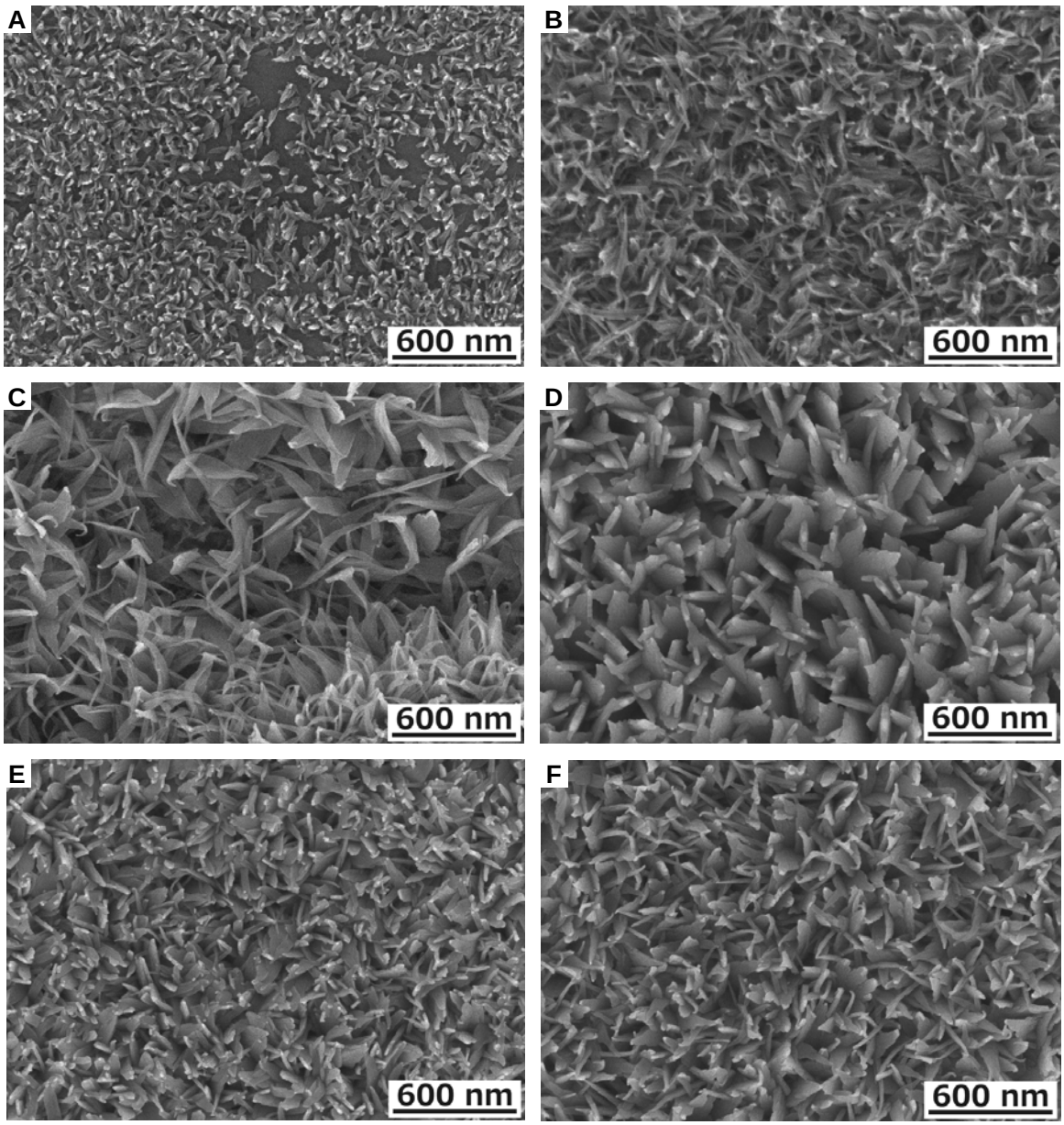

Fig. S5 SEM images of CuO nanobelt arrays obtained at varied reaction periods: (A), 10min; (B), 30min; (C), 1h; (D), 3h; (E), 7h; (F), 10h. 100 mM NH_3−100 mM H_2O_2 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S6

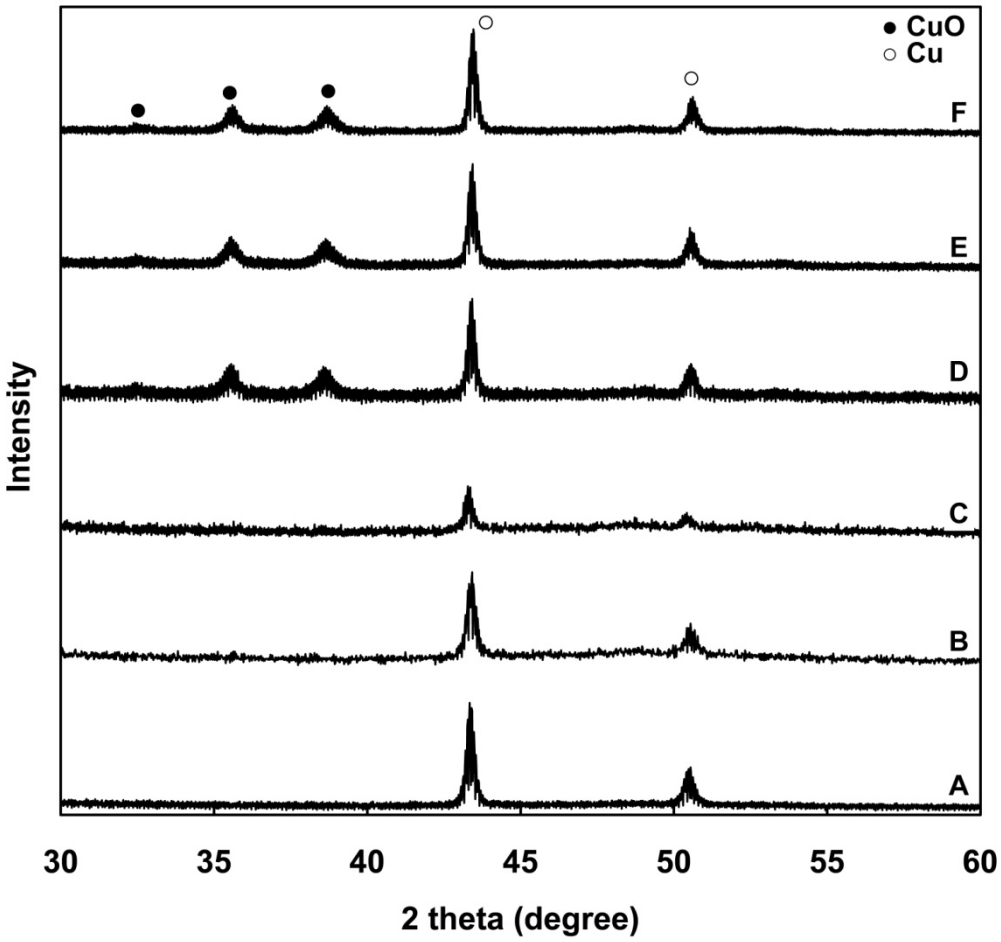

Fig. S6 XRD patterns of CuO nanobelts obtained at varied reaction periods: (A), 10min; (B), 30min; (C), 1h; (D), 3h; (E), 7h; (F), 10h. 100 mM NH_3−100 mM H_2O_2 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S7

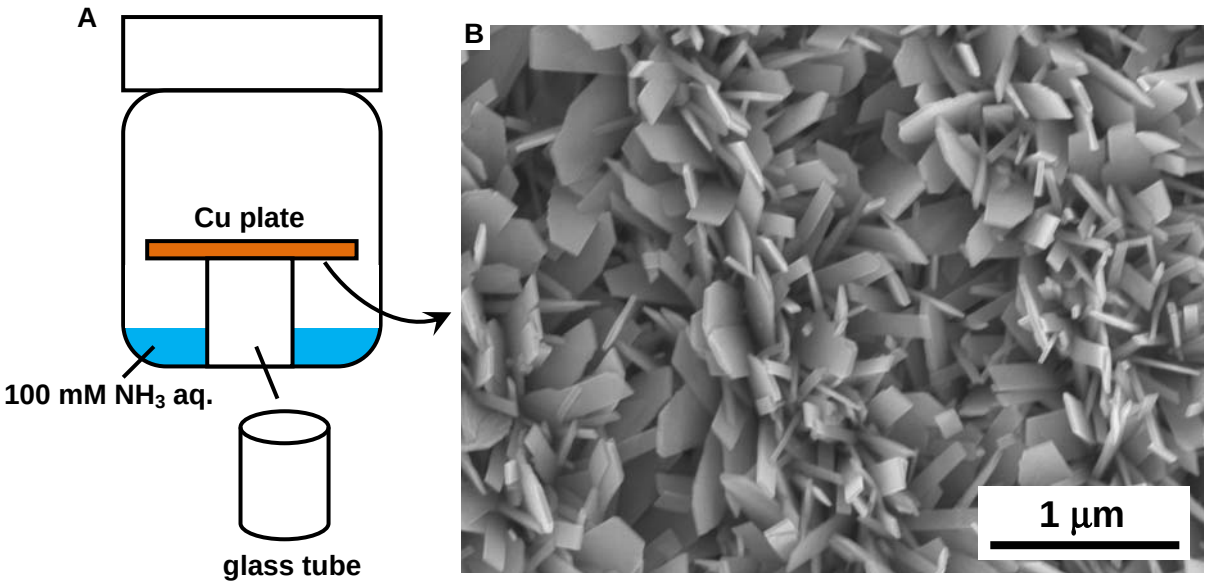

Fig. S7 (A) A schematic illustration of a VO process. (B) An SEM image of Cu nanobelt arrays formed by the vapor oxidation process.

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Fig. S8

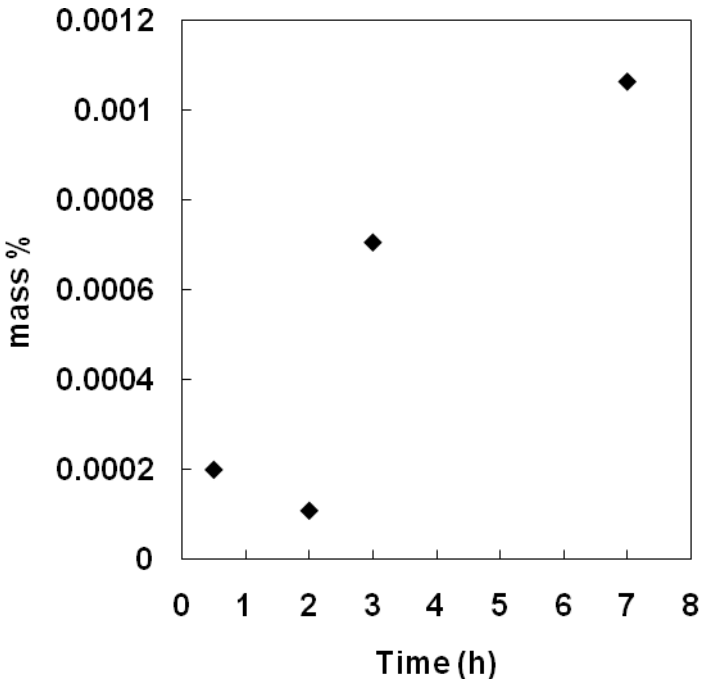

Fig. S8 Time courses of the amount of copper in the NH_3/H_2O_2 aqueous solution after the VO reaction.

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Fig. S9

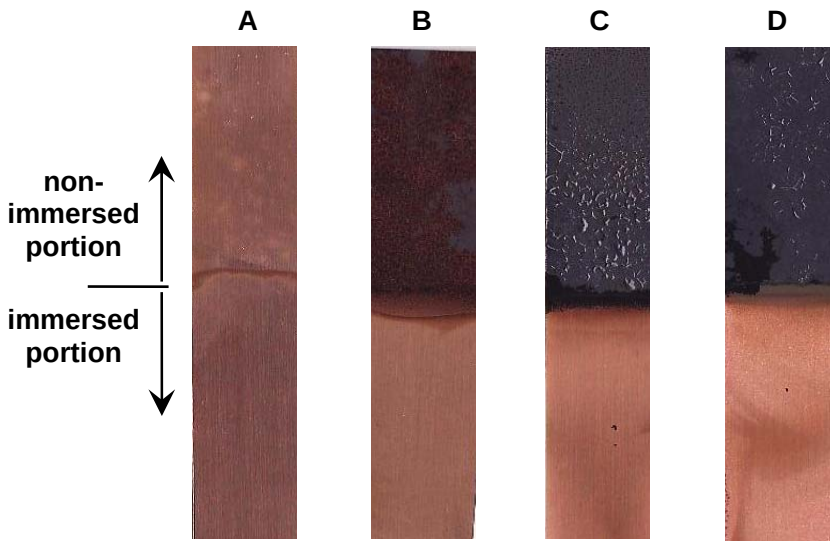

Fig. S9 Pictures of Cu substrates after the VO reaction: (A), 10min; (B), 1h; (C), 5h; (D), 24h. 100 mM NH_3 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S10

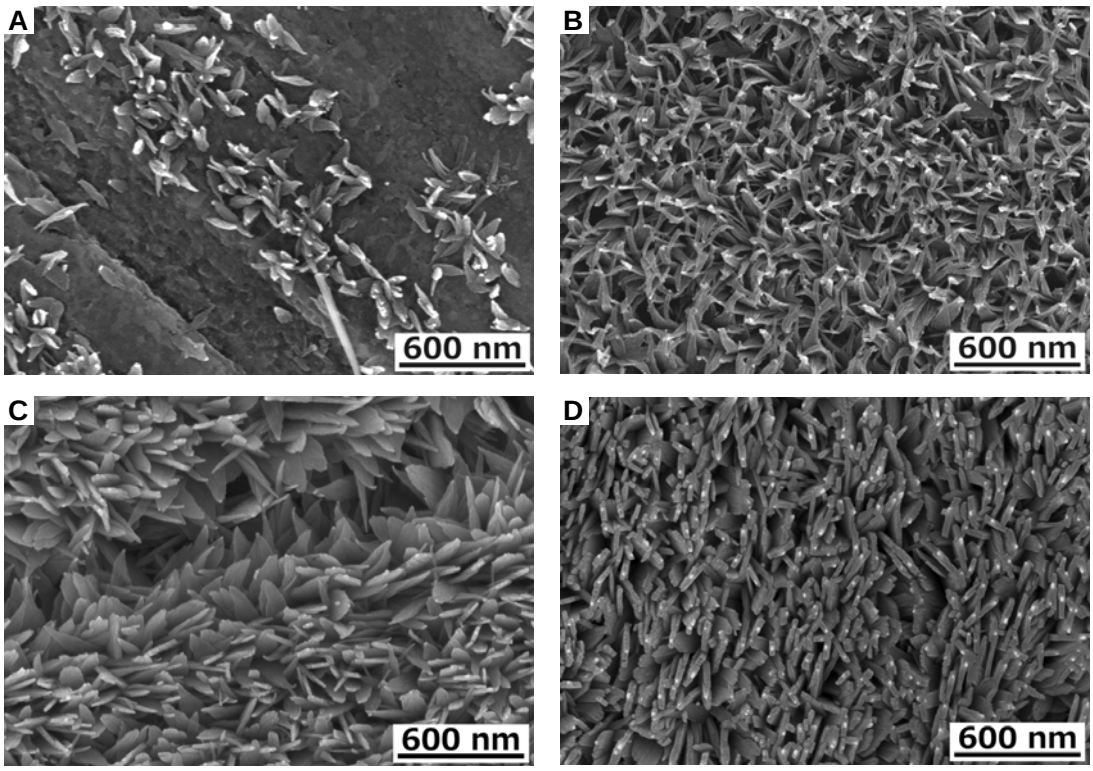

Fig. S10 SEM images of CuO nanobelt arrays obtained at varied reaction periods: (A), 10min; (B), 1h; (C), 5h; (D), 24h. 100 mM NH_3 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S11

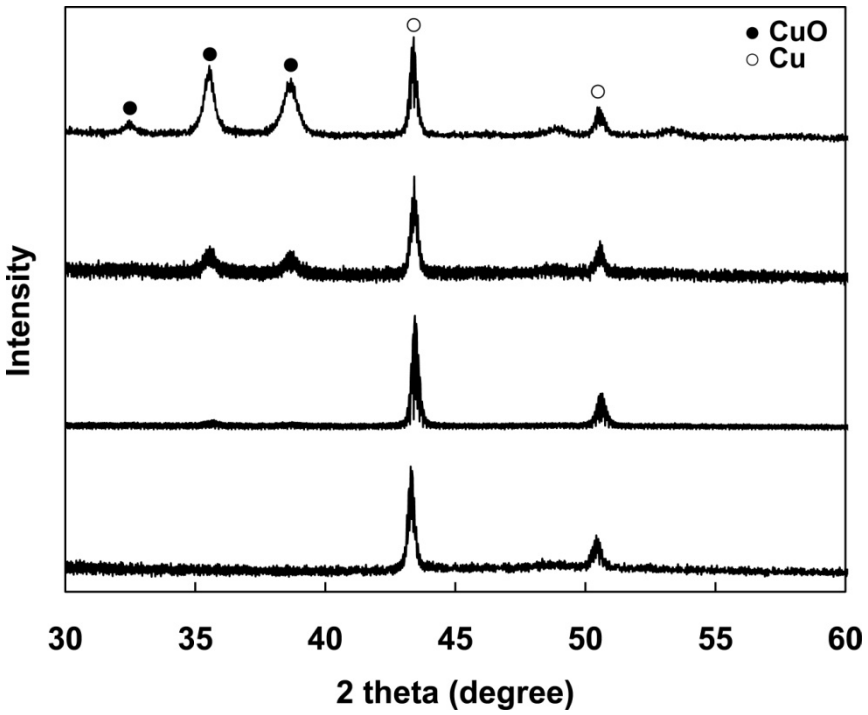

Fig. S11 XRD patterns of CuO nanobelt arrays obtained at varied reaction periods: (A), 10min; (B), 1h; (C), 5h; (D), 24h. 100 mM NH_3 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S12

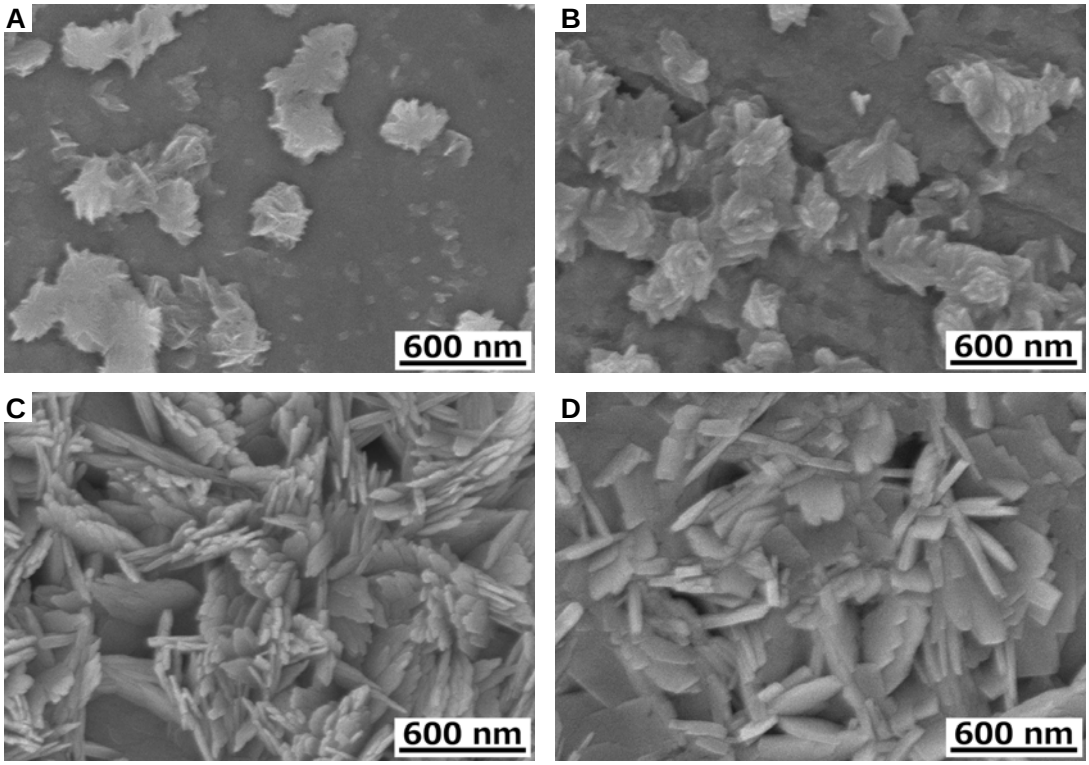

Fig. S12 SEM images of Cu plate after the VO reaction at varied pH: (A), pH 2; (B), pH 8; (C), pH 10; (D), pH 13. 100 mM NH_3 aqueous solution (19 mL); reaction temperature, 80 °C.

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Fig. S13

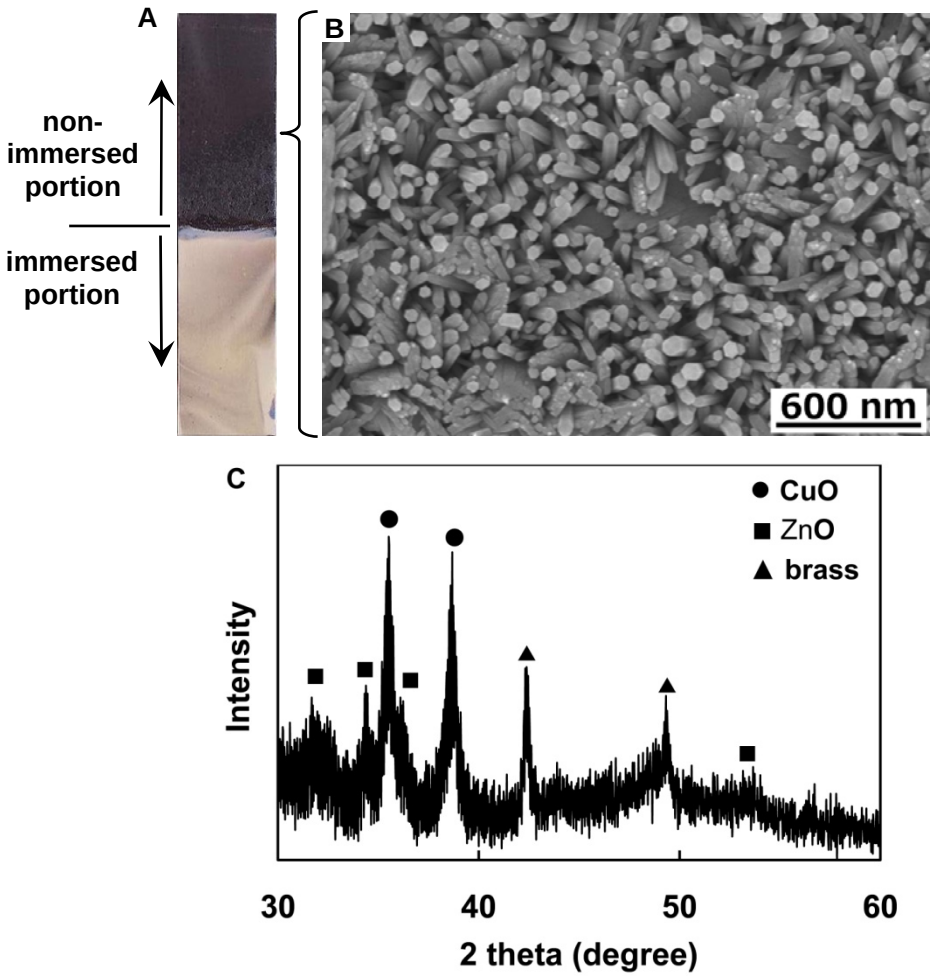

Fig. S13 (A) A Picture of a brass plate after the VO reaction (100 mM NH_3 aqueous solution, 24 h). A SEM image (B) and XRD pattern (C) of CuO/ZnO composite nanoarrays formed on brass plate.

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Fig. S14

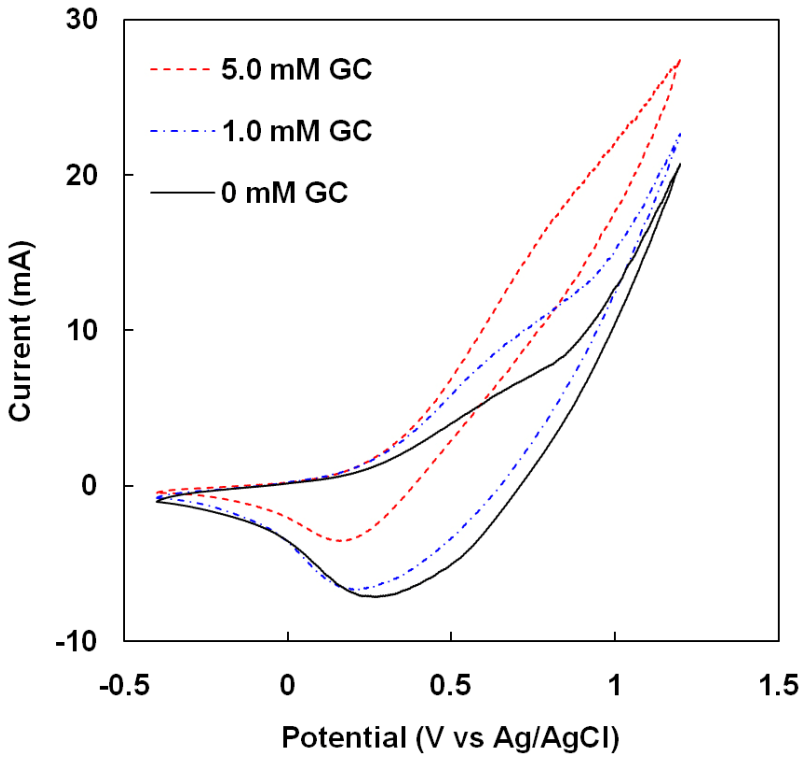

Fig. S14 Cyclic voltammograms (CVs) of glucose in 0.5 mol L^{-1} NaOH. The scan rate is 10 mV s^{-1}.

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Table S1

Table S1. Comparison of analytical performance of the present CuO nanobelt/Cu sensor with other reported non-enzymatic glucose sensors

Electrode type	Sensitivity ($\mu A\ mM^{-1}$ or $\mu A\ mM^{-1}\ cm^{-2}$)	Detection limit (μM)
Pt nanotube array electrode[1]	0.1	1.0
Mesoporous Pt electrode[2]	9.6	N/A
Electrode based on bimetallic PtM (M = Ru, Pd, and Au)-CNT-ionic liquid[3]	10.7	50.0
Porous Au electrode[4]	11.8	5.0
Pt-Pb nanoparticles deposited on MWCNTs[5]	17.8	1.8
Macroporous Pt electrode[6]	31.3	0.1
3-D gold film electrode[7]	46.6	3.2
Gold nanoparticles electrode[8]	179.0	0.05
Cu nanocluster/MWCNTs/GC electrode[9]	253.0	0.21
Gold nanowire array electrode[10]	309.0	50.0
CuO nanorods-graphite electrode[11]	371.4	4.0
CuO nanospheres electrode[12]	404.5	1.0
Ni-carbon nanofiber paste electrode[13]	420.4	1.0
CuO nanofiber electrode[14]	431.3	0.8
CuO nanowire modified Cu electrode[15]	490.0	0.049
CuO nanowalls/Cu electrode[16]	556.3	0.05
CuO nanobelts/Cu electrode (This work)	582.0	<1.0
Self-assembled CNT thin films with Cu nanoparticles electrode[17]	602.0	0.1
CuO nanoflowers-graphite electrode[11]	709.5	4.0
Ni nanowire array electrode[18]	1043	0.1
CuxO nanoflower/Cu electrode[19]	1620	0.049
CuO-MWCNTs array electrode[20]	2190	0.8

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