

Supporting Information

One-Pot Preparation of Hierarchical Cu_2O Hollow Spheres for Improved Visible-Light Photocatalytic Properties

Yali Dong^a, Feifei Tao^{a,b,*}, Linxia Wang^{a,*}, Mingxuan Lan^a, Jiayan Zhang^a and Tianjie Hong^a

¹ Department of Chemistry and Chemical Engineering, Shaoxing University, Zhejiang 312000, P.

R. China;

² Shanghai Advanced Research Institute Library, Chinese Academy Sciences, Shanghai 201210, P.

R. China

* Correspondence: feifeitao@usx.edu.cn; Tel.: +86-575-88342505.

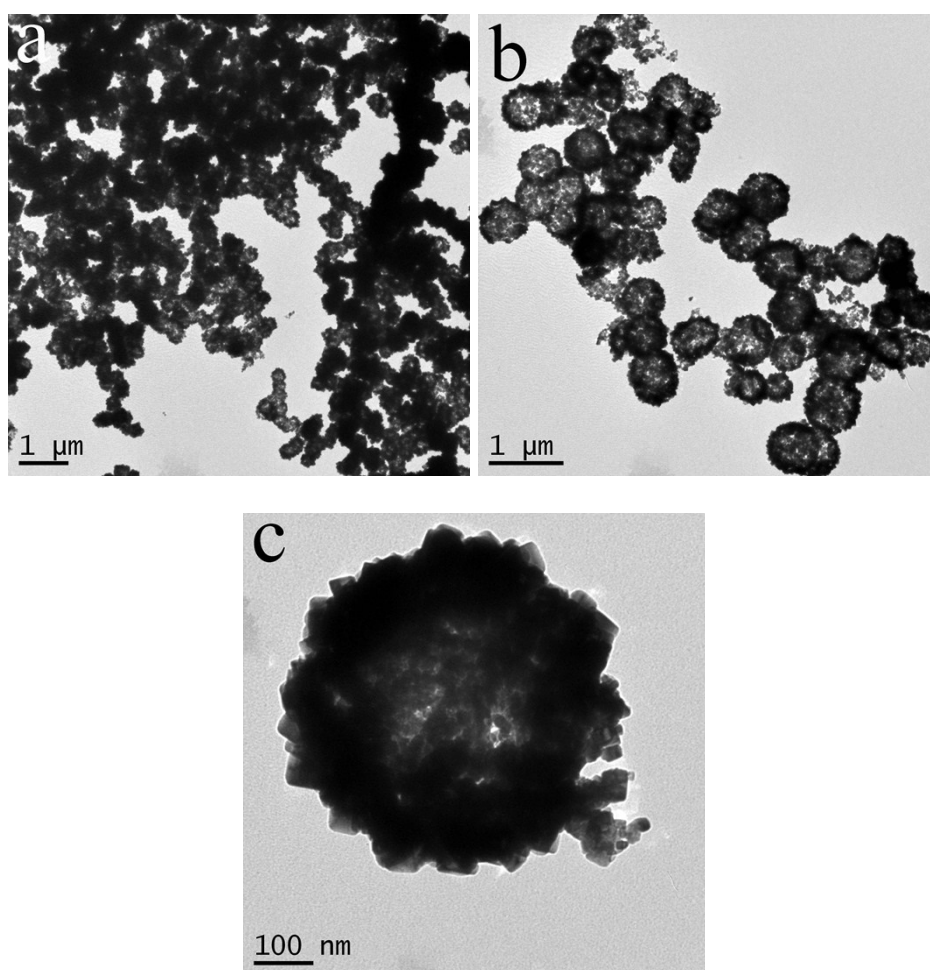


Fig. S1 TEM images of the as-prepared product at different magnification.

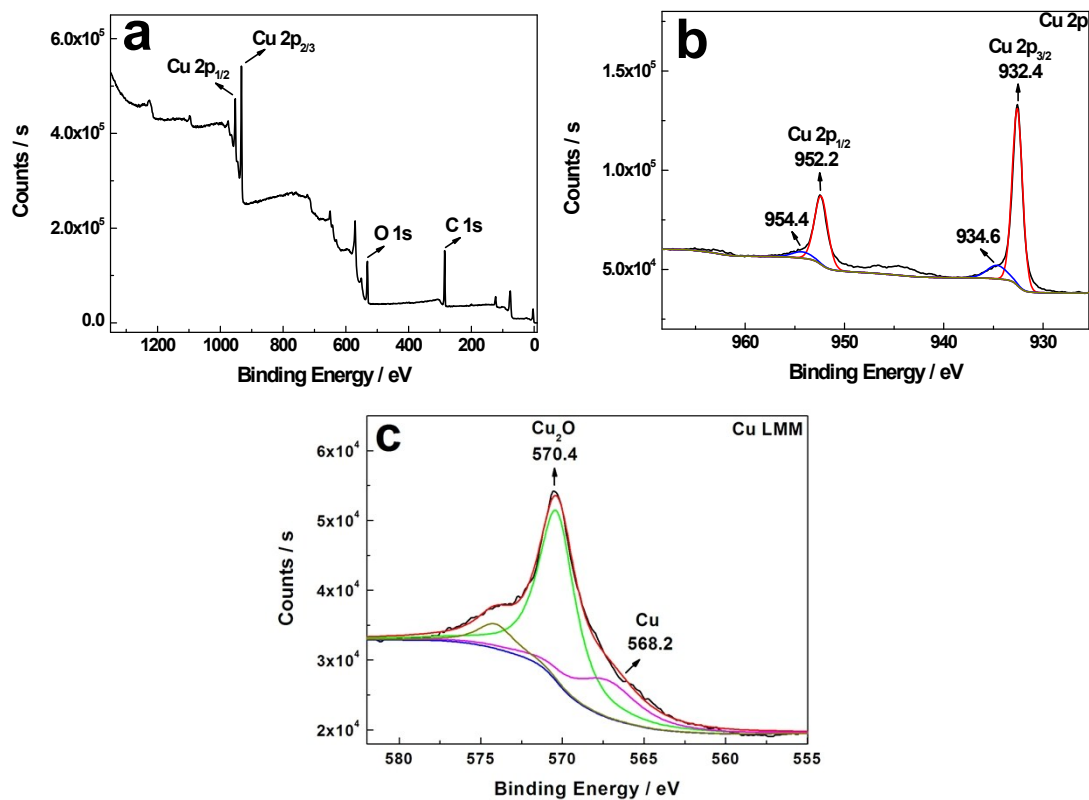


Fig. S2 The XPS survey spectrum (a), high resolution Cu 2p XPS (b) and Auger Cu LMM spectra (c) of the as-prepared product.

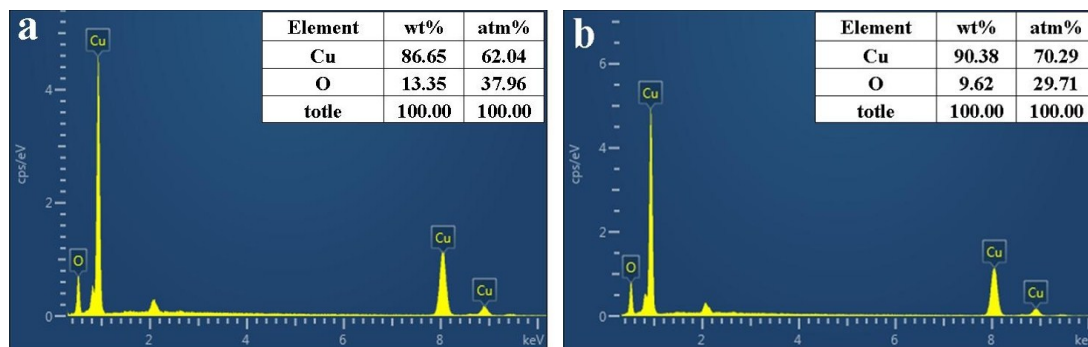


Fig. S3 EDS patterns and elemental contents (inset) from bulk (a) and surface (b) of the as-prepared product.

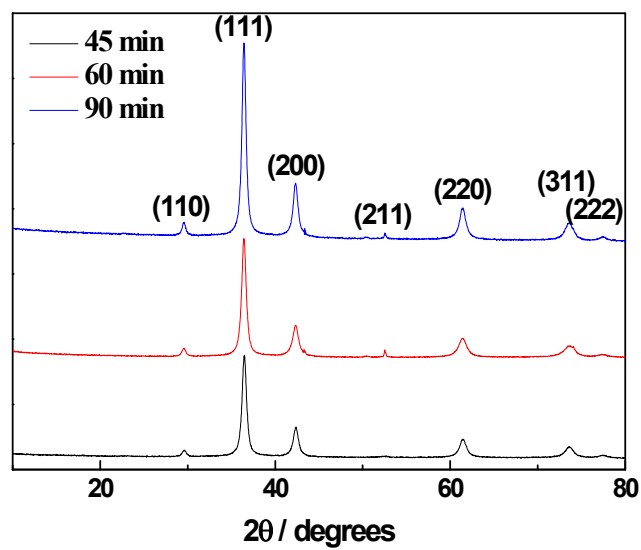


Fig. S4 XRD patterns of the as-prepared products at the reaction time of 45, 60 and 90 min.

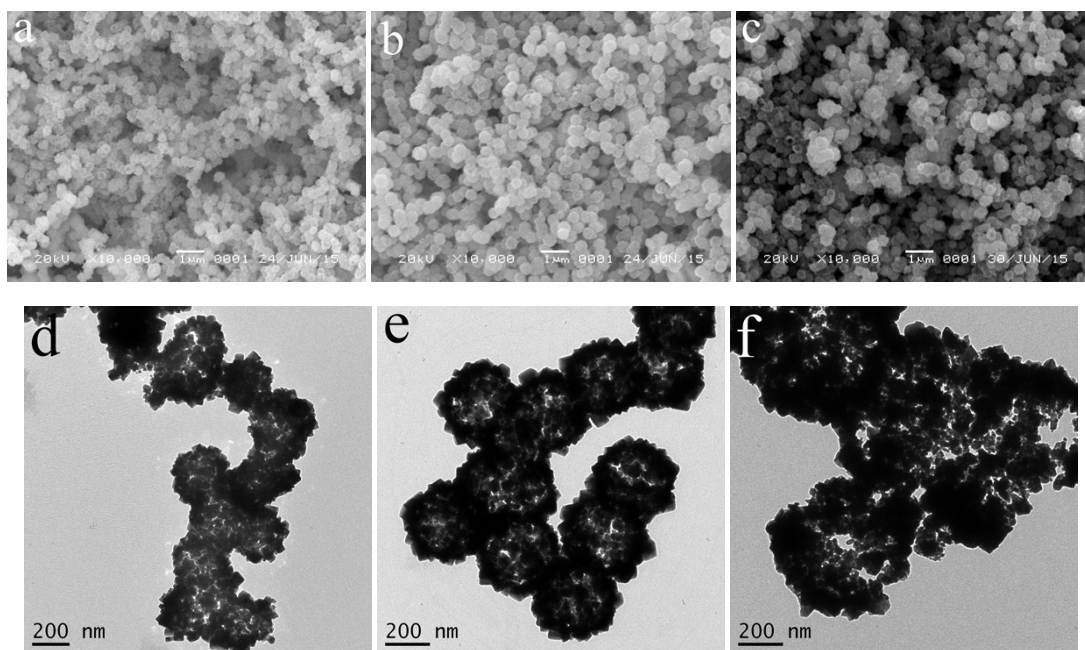


Fig. S5 SEM (a-c) and TEM (d-f) images of the as-prepared products at the different temperatures: (a and d) 150 °C, (b and e) 160 °C, and (c and f) 180 °C.

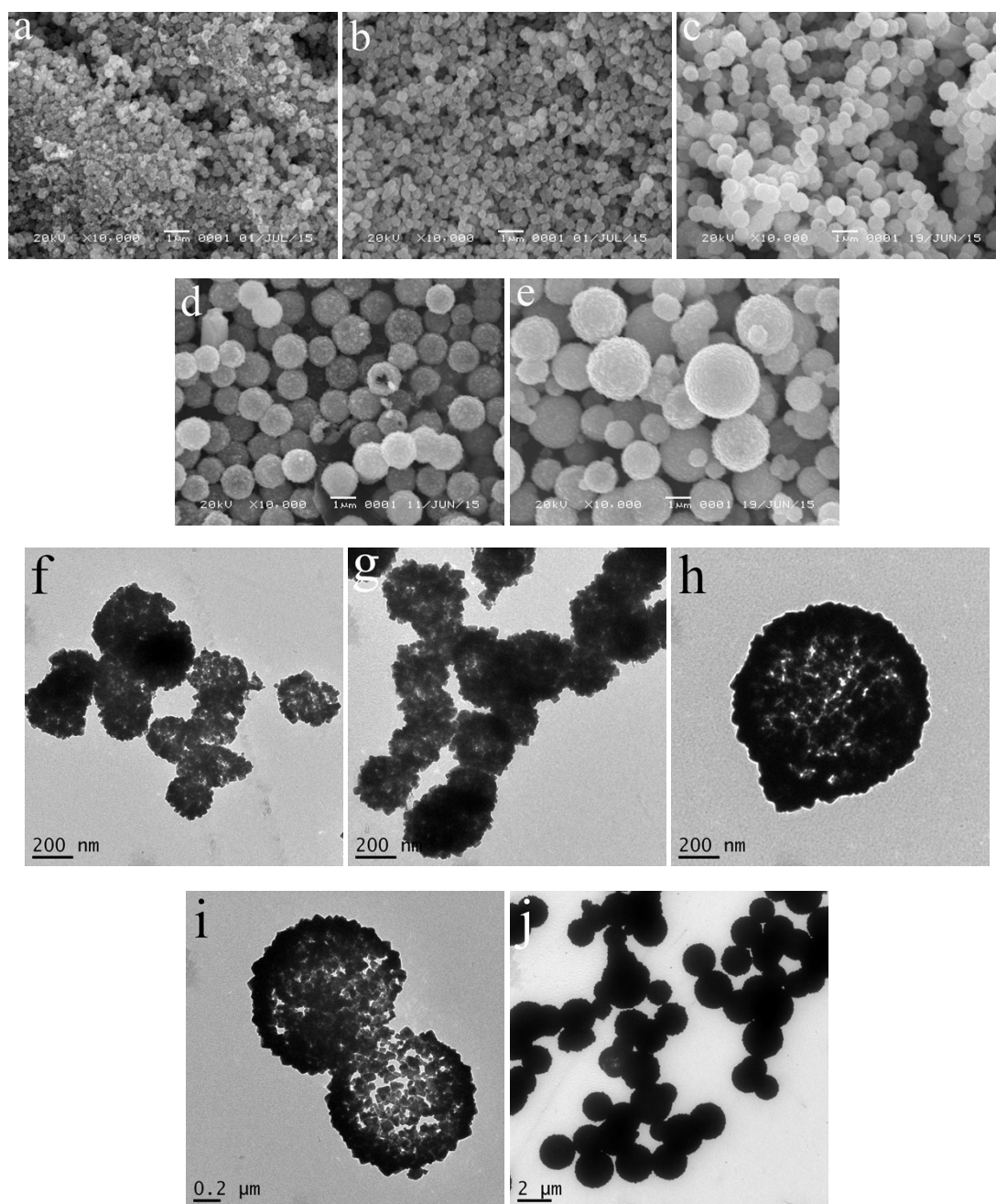


Fig. S6 SEM (a-e) and TEM images (f-j) of the as-prepared products using the different [BMIM]BF₄ concentration: (a and f) 0.0125 mol·L⁻¹, (b and g) 0.025 mol·L⁻¹, (c and h) 0.075 mol·L⁻¹, (d and i) 0.1 mol·L⁻¹, and (e and j) 0.15 mol·L⁻¹.

Table S1 Comparison of the photocatalytic activities of various Cu₂O catalysts for the degradation of MO.

Photocatalyst	Light source	Additive	Photocatalytic condition	Degradation activity	Degradation rate / (mmol · g ⁻¹ · h ⁻¹)	Ref.
Cu ₂ O hollow spheres	250 W xenon arc lamp ($\lambda > 420$ nm)	None	Photocatalyst: 10 mg MO solution: 50 mL 20 mg · L ⁻¹	more than 90 % (20 min) completely degraded (30 min)	0.825	This study
rhombic dodecahedral Cu ₂ O	500 W xenon lamp ($\lambda = 400-700$ nm)	None	Photocatalyst: 15 mg MO solution: 100 mL 15 mg · L ⁻¹	88.3 % (30 min)	0.540	1
Cu ₂ O nanowires	500 W xenon lamp (420 nm < λ < 780 nm)	None	Photocatalyst: 4 mg MO solution: 100 mL 10 mg · L ⁻¹	73 % (120 min)	0.279	2
Cu ₂ O cubes	500 W xenon lamp	None	Photocatalyst: 71.54 mg MO solution: 90 mL 30 mg · L ⁻¹	~20 % (90 min)	0.0154	3
Cu ₂ O rhombic dodecahedra	500 W xenon lamp	None	Photocatalyst: 71.54 mg MO solution: 90 mL 30 mg · L ⁻¹	almost completely degraded (90 min)	0.0769	3
Cu ₂ O nanowire polyhedra	500 W Xe lamp (380 nm < λ < 700 nm)	H ₂ O ₂	Photocatalyst: 30 mg MO solution: 50 mL 20 mg · L ⁻¹	complete degraded (40 min)	0.153	4
oxygen-deficient Cu ₂ O nanoparticles	cold white LED (16 mW · cm ⁻²)	None	Photocatalyst : 2 mg MO solution: 20 mL 5 × 10 ⁻⁵ mol · L ⁻¹	~98 % (20 min)	1.47	5
Cu ₂ O hierarchical nanoclusters	150 W tungsten-halogen lamp	None	Photocatalyst: 0.01 g MO solution: 100 mL 10 mg · L ⁻¹ and 40 mg · L ⁻¹	completely degraded (12 min for 10 mg · L ⁻¹ MO solution and 65 min for 40 mg · L ⁻¹)	1.528 (10 mg · L ⁻¹) 1.128 (40 mg · L ⁻¹)	6
octahedral, truncated octahedral, cuboctahedral, truncated cubic and cubic Cu ₂ O microcrystals	500 W xenon lamp ($\lambda > 400$ nm)	None	Photocatalyst: 0.025 g MO solution: 50 mL 15 mg · L ⁻¹	100 % for octahedral Cu ₂ O (3 h) 76 % for truncated octahedral Cu ₂ O (3 h) 28 % for cuboctahedral Cu ₂ O (3 h) 36 % for truncated cubic Cu ₂ O (3 h) 17 % for cubic Cu ₂ O (3 h)	0.0306 (octahedral Cu ₂ O) 0.0232 (truncated octahedral Cu ₂ O) 0.00855 (cuboctahedral Cu ₂ O) 0.0100 (truncated cubic Cu ₂ O) 0.00519 (cubic Cu ₂ O)	7

Cu₂O spheres 1000 W Xe Photocatalyst: 15.0 mg also completely 0.244
 arc lamp None MO solution: 60.0 mL degraded (4 h)

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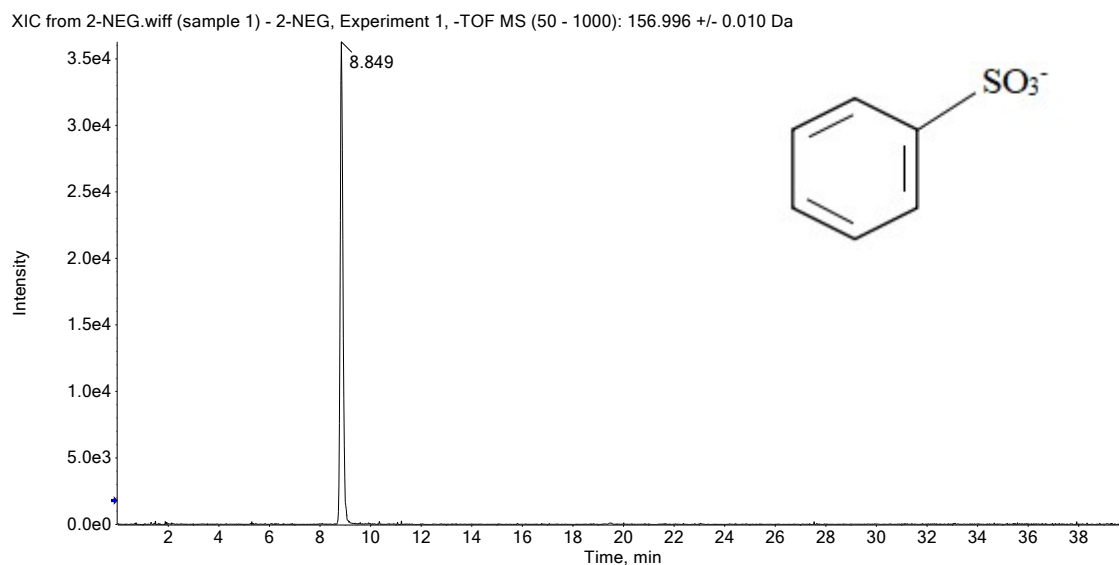


Fig. S7 Mass spectrum of the MO solution under the 60-min visible-light irradiation over the hierarchical Cu₂O hollow spheres.

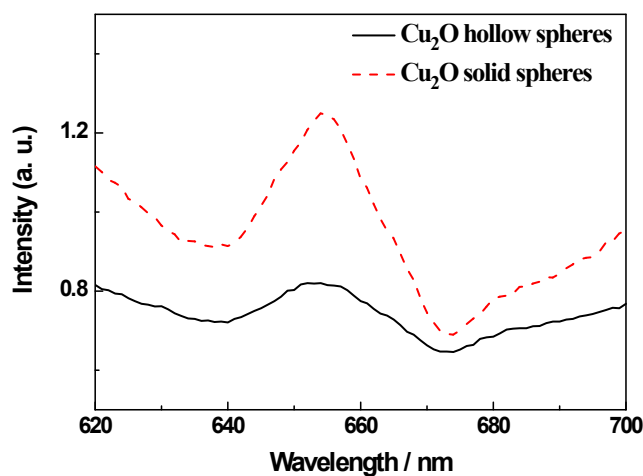


Fig. S8 PL spectra of Cu₂O hollow spheres and Cu₂O solid spheres at an excitation wavelength of 436 nm.

References

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