Supporting Information

Spatial separation of photogenerated charges on anisotropic facets of cuprous oxide

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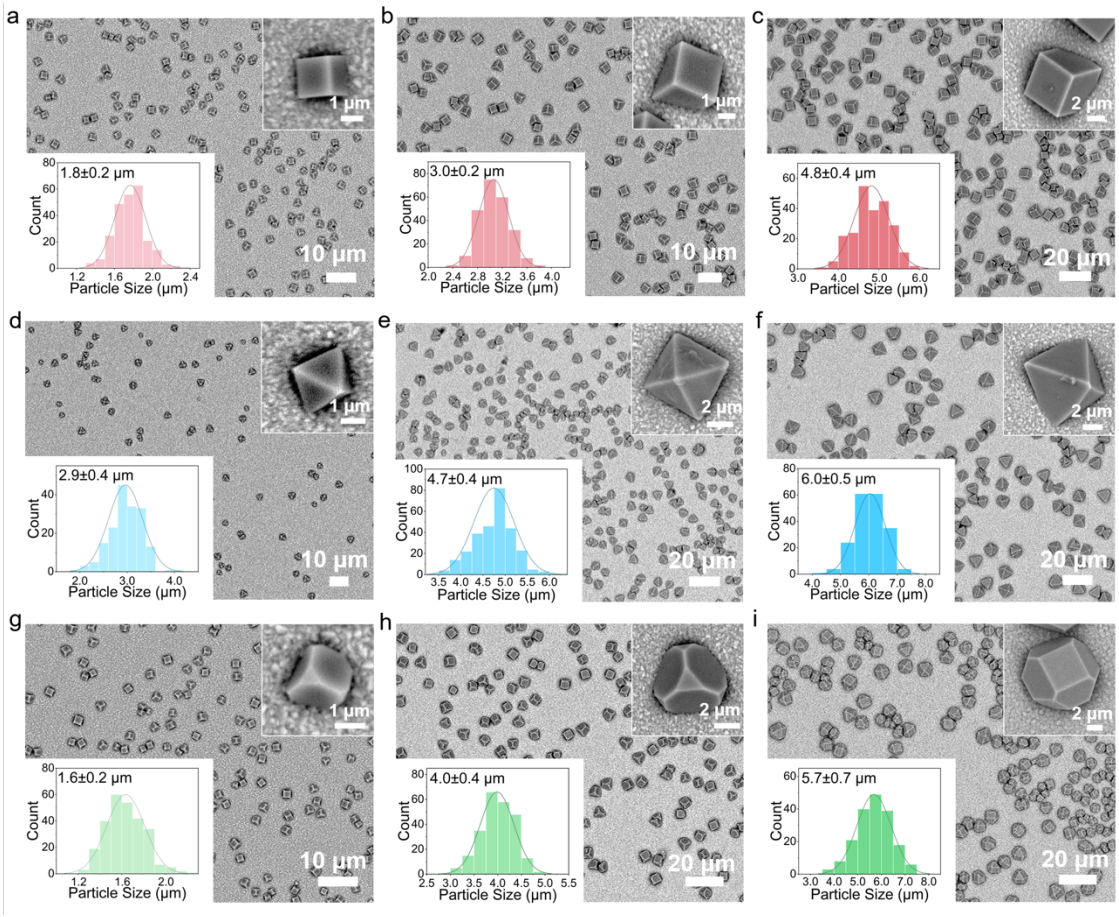

Figure S1. Morphology and particle size distribution of as-prepared Cu_2O crystals with different exposed facets. SEM images and particle size distribution of c-Cu_2O (a-c), o-Cu_2O (d-f) and t-Cu_2O (g-i), synthesized under an electrodeposition time of 1 min (a, d, g), 5 min (b, e, h) and 10 min (c, f, i), respectively.

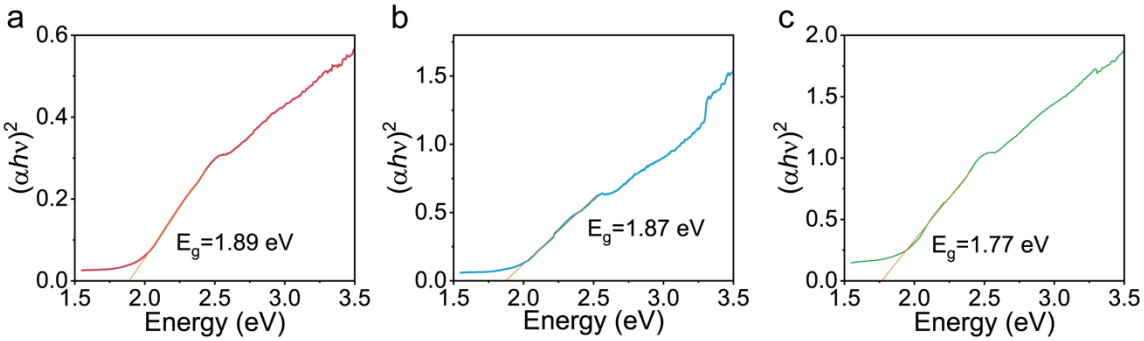

Figure S2. Characterization of light absorption properties. Tauc plots of c-Cu_2O (a), o-Cu_2O (b) and t-Cu_2O (c).

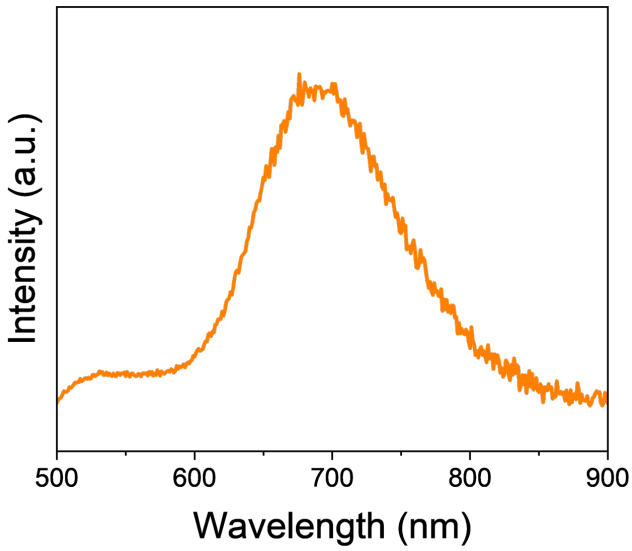

Figure S3. Steady state photoluminescence spectrum of as-prepared Cu_2O.

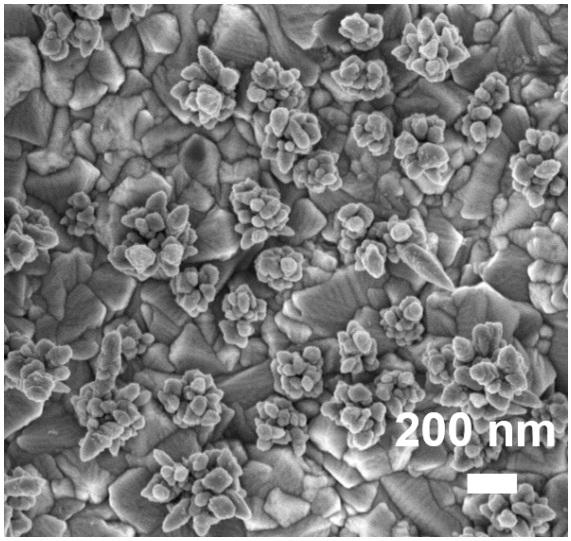

Figure S4. The newly formed particles observed on the FTO substrate after reaction in an acid media.

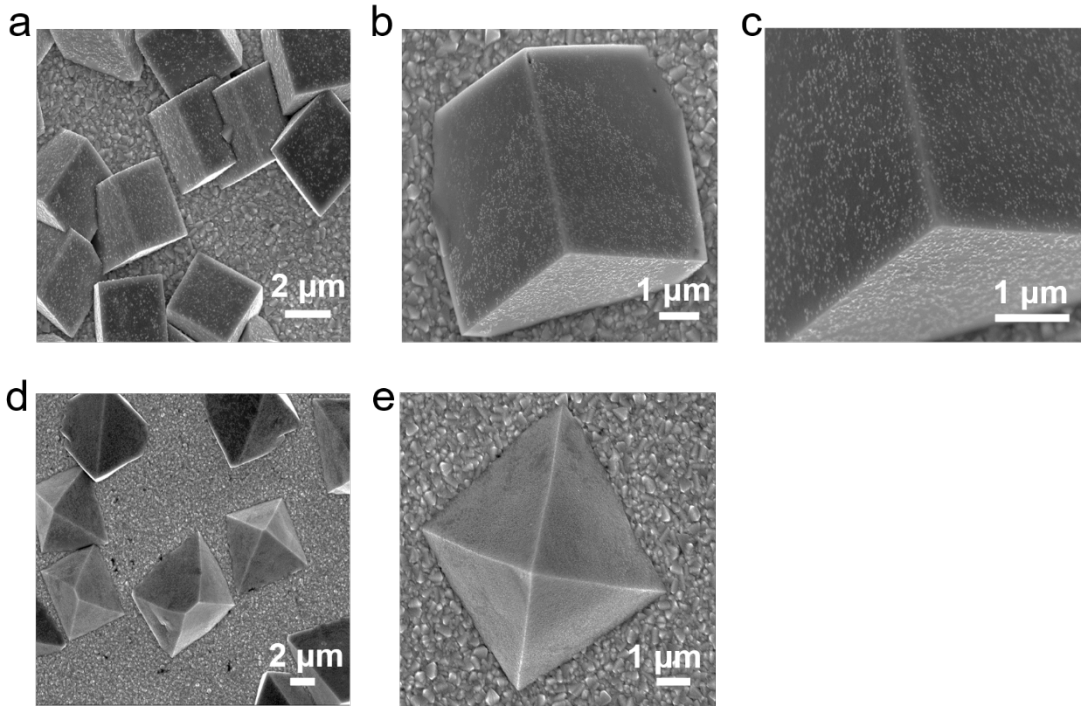

Figure S5. Morphology evolution of Cu_2O in a neutral electrolyte. SEM images of c-Cu_2O (a-c), o-Cu_2O (d-e) after photoelectrocatalysis at 0 V vs. RHE for 3 min in 1 M Na_2SO_4.

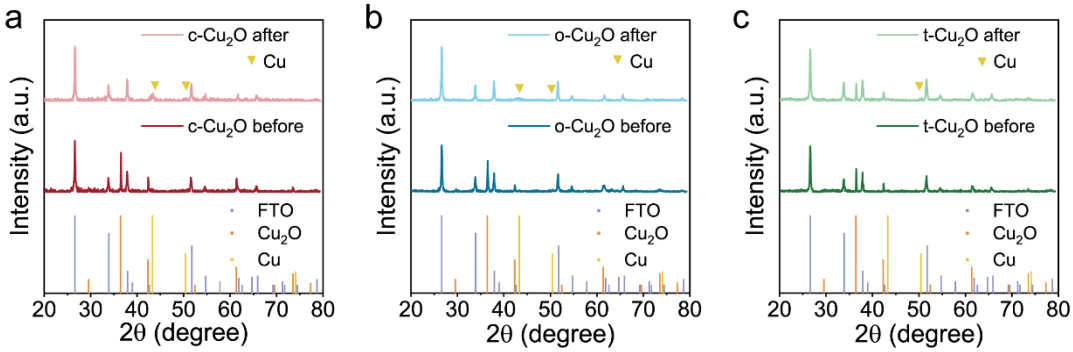

Figure S6. Comparison of Cu_2O before and after HER. X-ray diffraction patterns of c-Cu_2O (a), o-Cu_2O (b) and t-Cu_2O (c) before and after HER. Reactions were carried out under 0 V vs. RHE for 30 min in 1 M Na_2SO_4.

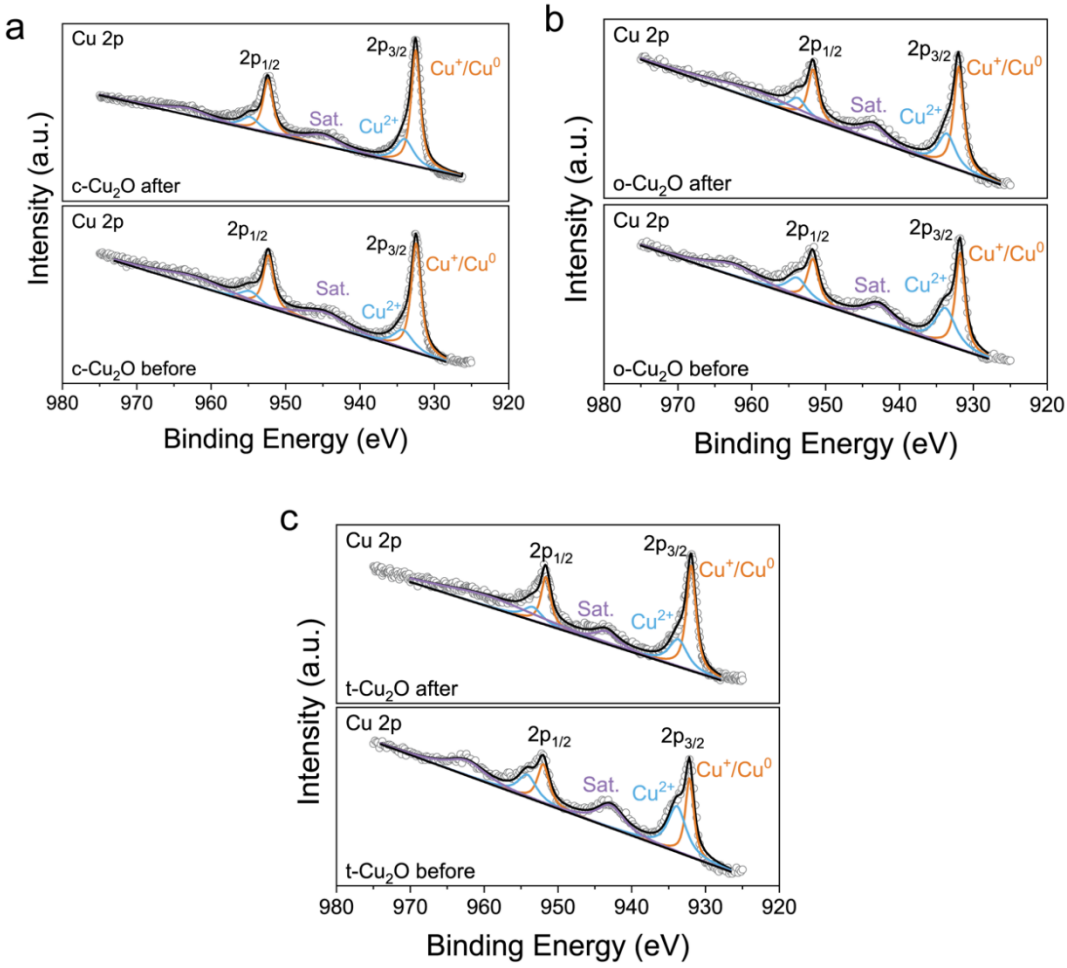

Figure S7. X-ray photoelectron spectrum of c-Cu_2O (a), o-Cu_2O (b) and t-Cu_2O (c) before and after HER. Reactions were carried out under 0 V vs. RHE for 30 min in 1 M Na_2SO_4.

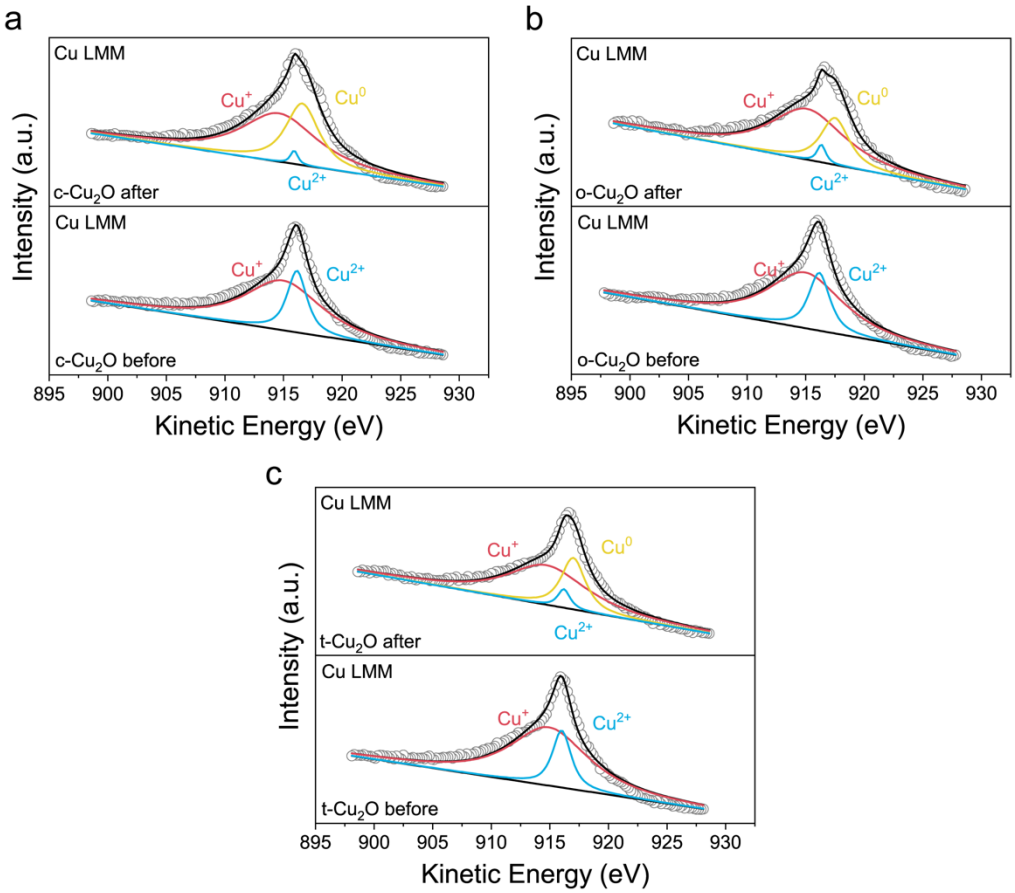

Figure S8. Cu LMM Auger electron spectra of c-Cu_2O (a), o-Cu_2O (b) and t-Cu_2O (c) before and after HER. Reactions were carried out under 0 V vs. RHE for 30 min in 1 M Na_2SO_4.

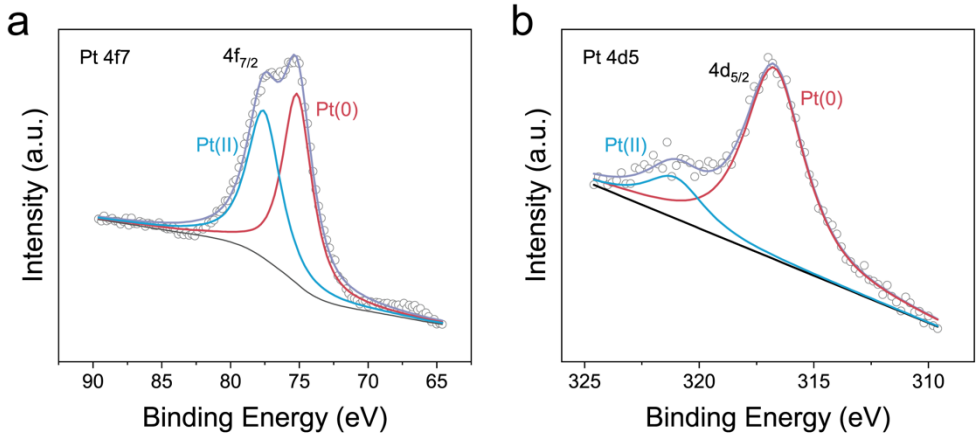

Figure S9. XPS spectra after photodeposition of Pt. The peak for Pt(II) can be attributed to the incomplete reduction of H_2PtCl_6. Since the precursor of Pt photodeposition is H_2PtCl_6 with Pt(IV), the presence of Pt(II) still can demonstrate the occurrence of Pt(IV) reduction process by photogenerated electrons.

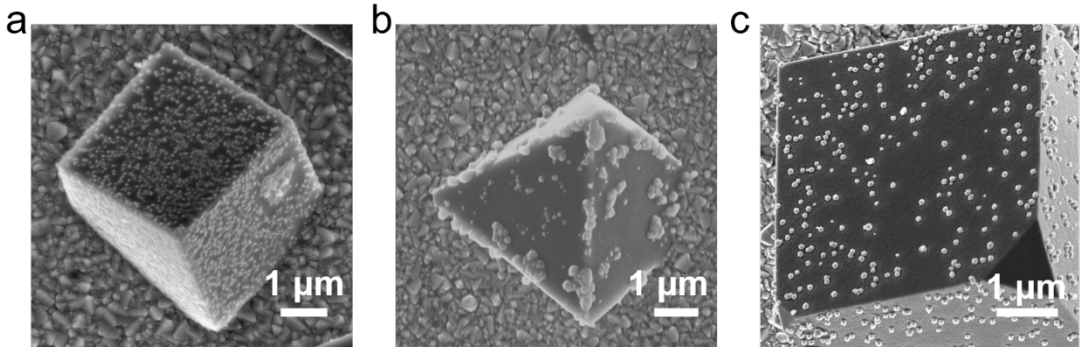

Figure S10. SEM images of c-Cu_2O(a), o-Cu_2O(b) and t-Cu_2O(c) after Pt photodeposition.

Table S1. Fitting parameters of biexponential PL decay.

Sample	Decay lifetime (ns)		Amplitude		Average lifetime (ns)
	τ_1	τ_2	A_1	A_2	τ
c-Cu_2O	141.0538	1618.694	0.54753	0.32342	1428.731
o-Cu_2O	87.92246	1381.479	0.54537	0.39306	1276.519
t-Cu_2O	241.5337	1990.808	0.59169	0.29374	1647.265