Frontiers of Materials Science

Electronic Supplementary Material

Engineering oxygen-vacancy-rich NiO/CuO composites for efficient photoelectrocatalytic methanol oxidation

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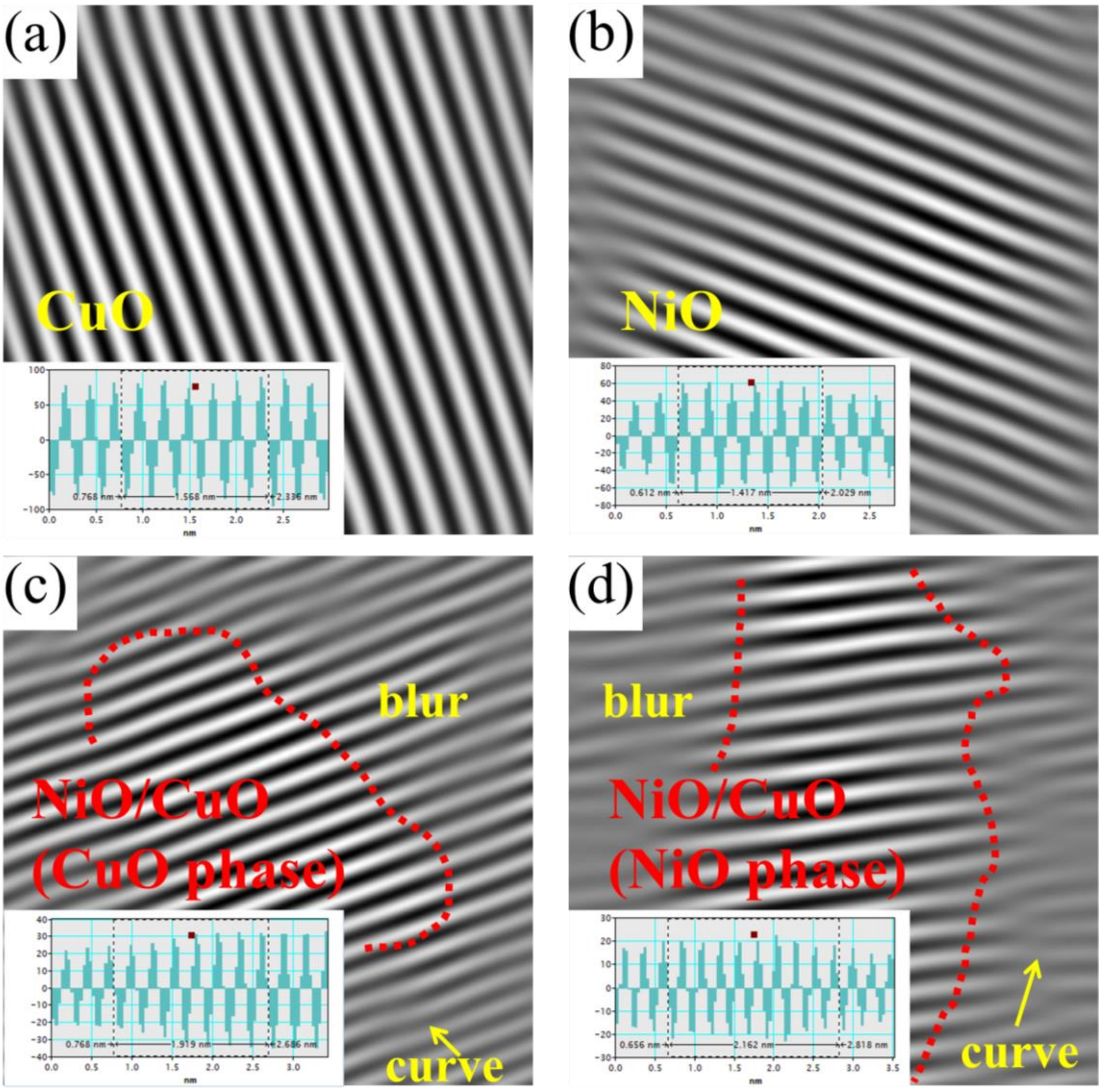

Fig. S1 The lattice stripes of **(a)** CuO, **(b)** NiO, **(c)** CuO crystal plane in NiO/CuO, and **(d)** NiO crystal plane in NiO/CuO.

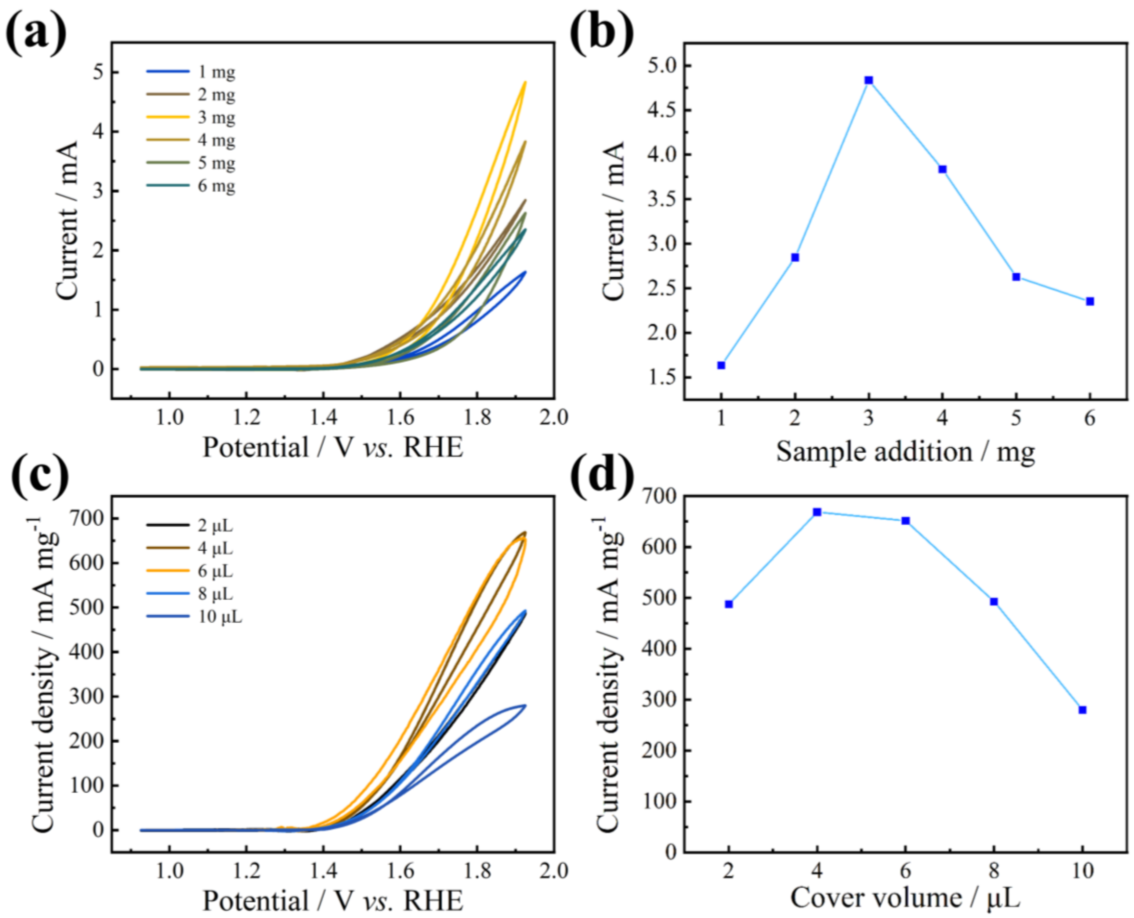

Fig. S2 **(a)** CV curves of different NiO/CuO addition during process 1 mL NiO/CuO ink. **(b)** Relationship between peak current and NiO/CuO loading in Panel (a). **(c)** CV curves of different ink coated during process NiO/CuO modified electrode. **(d)** Relationship between peak current and NiO/CuO loading in Panel (c). Electrolyte: 1.0 mol·L^{-1} KOH + 1.0 mol·L^{-1} methanol.

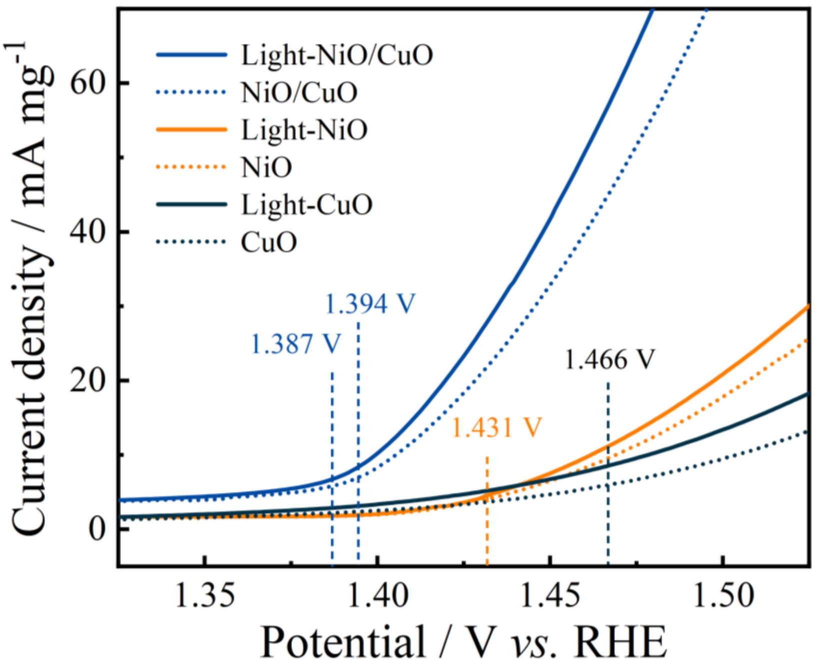

Fig. S3 LSV curves of NiO/CuO, NiO and CuO in a 1.0 mol·L^{-1} KOH electrolyte containing 1.0 mol·L^{-1} methanol.

Table S1 The electrocatalytic performance comparison between NiO/CuO and other nanomaterials in previous reports (GCE = glassy carbon electrode, CC = carbon cloth)

Catalyst	Working electrode	Activity		Electrolyte	Ref.
		η_1/(mA·cm^{-2})	η_2/(A·g^{-1})		
NiO/CuO (with light)	GCE	243	956	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	This work
NiO/CuO (without light)	GCE	220	867	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	This work
$Ni_{0.75}Cu_{0.25}$	Ti foils	140	–	1.0 mol·L^{-1} NaOH 0.5 mol·L^{-1} CH_3OH	[S1]
Cu/NiCuNWs/C	GCE	34.9	867.1	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	[S2]
Cu–Ni–S	CC	67	–	1.0 mol·L^{-1} KOH 0.5 mol·L^{-1} CH_3OH	[S3]
CuO–C/$NiCo_2O_4$	GCE	194.6	–	1.0 mol·L^{-1} NaOH 1.0 mol·L^{-1} CH_3OH	[S4]
Cu–Ni NWs	GCE	–	425	1.0 mol·L^{-1} NaOH 0.5 mol·L^{-1} CH_3OH	[S5]
3D Ni/NiO/RG	GCE	79.5	1262.1	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	[S6]
Ni/Ni_3S_2–MoO_2	CC	240.08	–	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	[S7]
Ni/CeO_2@CN	CC	229.56	–	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	[S8]
Mn–NiO	GCE	58	–	1.0 mol·L^{-1} KOH 1.0 mol·L^{-1} CH_3OH	[S9]

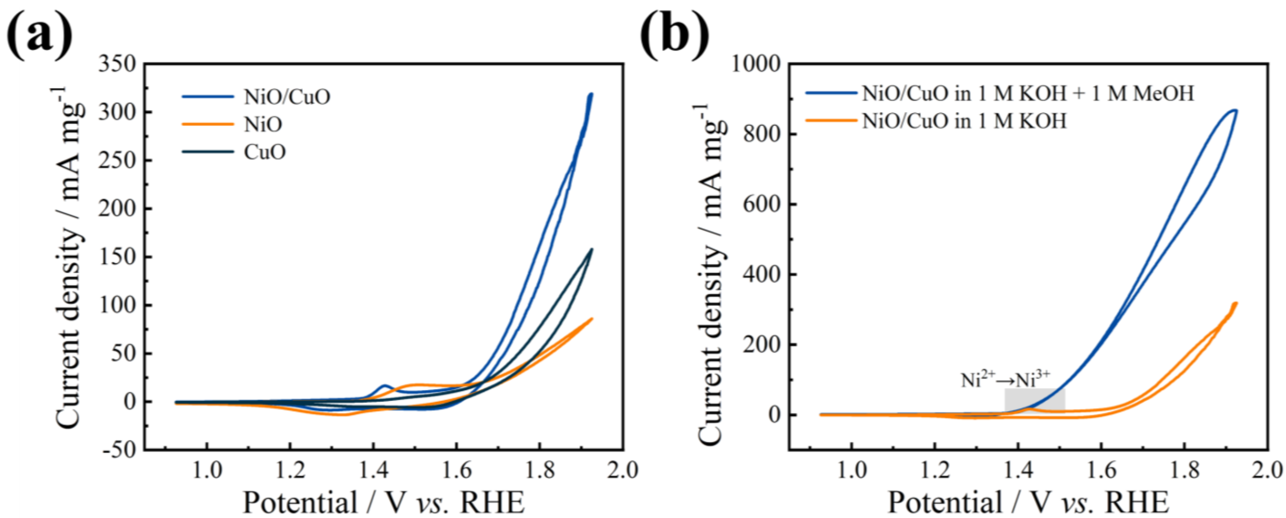

Fig. S4 CV curves: **(a)** NiO/CuO, NiO, and CuO in 1 mol·L^{-1} KOH; **(b)** NiO/CuO in 1.0 mol·L^{-1} KOH with 1.0 mol·L^{-1} methanol and 1.0 mol·L^{-1} KOH.

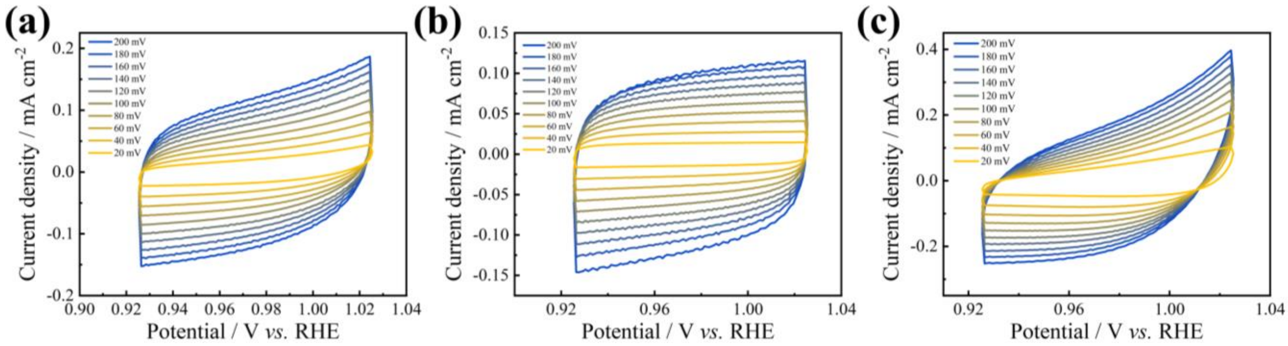

Fig. S5 CV curves of **(a)** CuO, **(b)** NiO and **(c)** NiO/CuO in 1 mol·L^{-1} KOH with different scan rates.

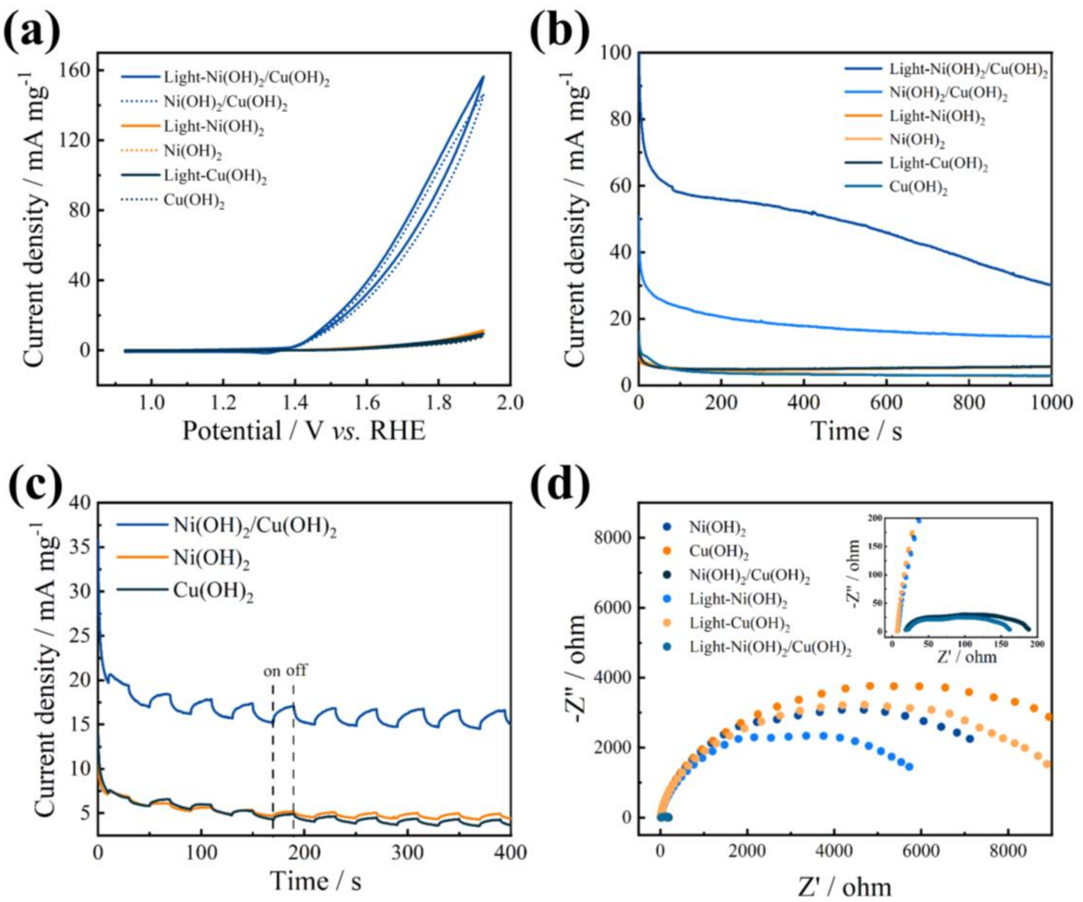

Fig. S6 **(a)** CV curves of Ni(OH)$_2$/Cu(OH)$_2$, Cu(OH)$_2$, and Ni(OH)$_2$ under light and no light radiation. **(b)** Chronoamperometric curves measured under light and no light radiation. **(c)** Photocurrent responses under light switch at a potential of 1.93 V (*vs.* RHE). **(d)** Nyquist plots. Electrolyte: 1.0 mol·L^{-1} KOH + 1.0 mol·L^{-1} methanol.

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