

Supporting Information

Investigation of Porosity and Heterojunction Effects of Mesoporous Hematite Electrode on Photoelectrochemical Water Splitting

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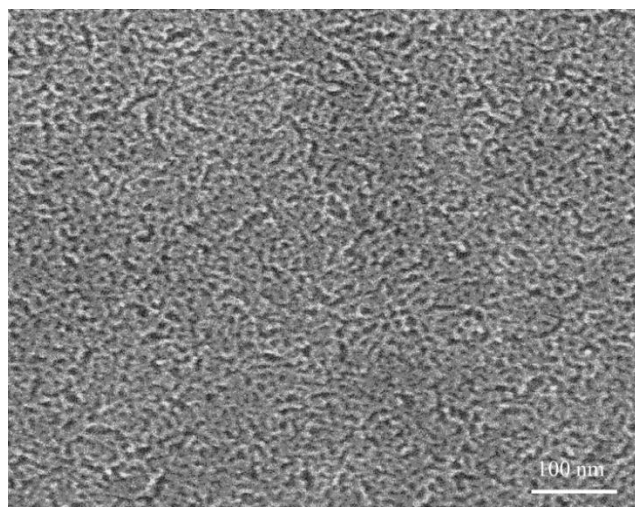


Fig. S1 SEM image of mesoporous α -Fe₂O₃ thin film with SnO₂ underlayer (MHF/SnO₂) prepared on FTO substrate calcined at 400 °C.

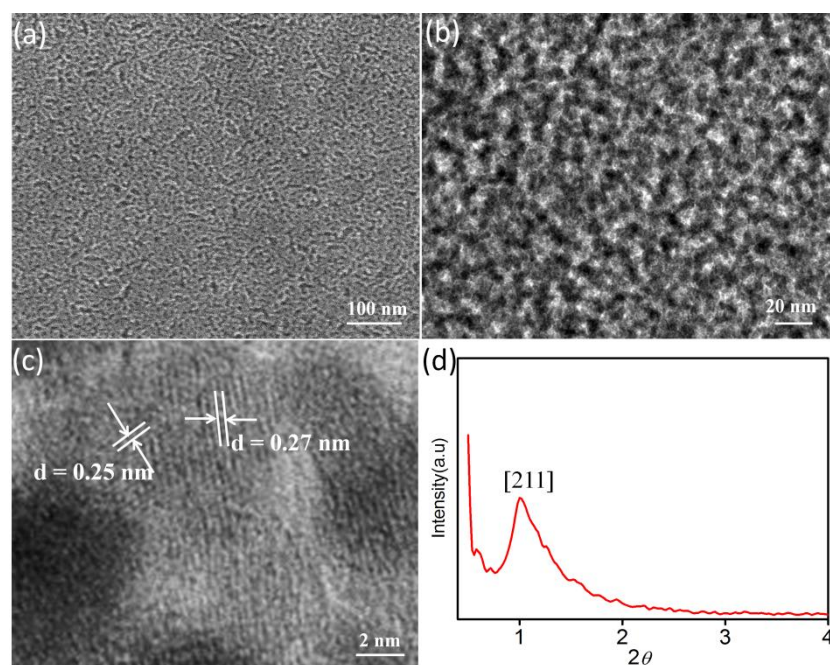


Fig. S2. (a) SEM image of mesoporous α -Fe₂O₃ thin film (MHF) prepared on FTO substrate, (b) TEM image of MHF, (c) HRTEM of MHF, (d) Small angle X-Ray Diffraction (XRD) patterns of MHF prepared on FTO substrate calcined at 300 °C.

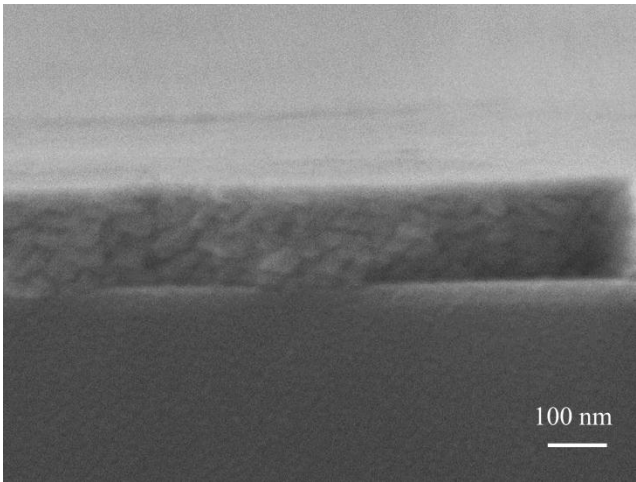


Fig. S3. Cross section SEM of NP-HF.

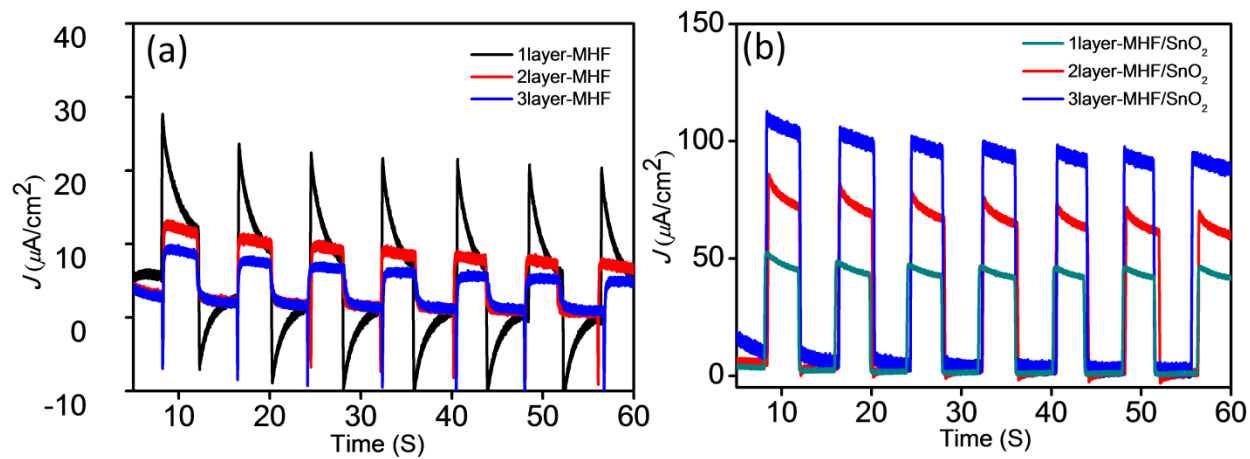


Fig. S4. (a) Comparison of Photocurrent of multilayers MHF prepared on FTO substrate without filter under front side, measured at +0.5 V vs Ag/AgCl in 1 M NaOH with AM 1.5 G illumination ($100 \text{ mW}/\text{cm}^2$). (b) Comparison of Photocurrent of multilayers MHF/SnO₂ prepared on FTO substrate without filter under front side measured at +0.5 V vs Ag/AgCl in 1 M NaOH with AM 1.5 G illumination ($100 \text{ mW}/\text{cm}^2$).

Table. S1 Comparison of PEC data of nanoporous based hematite electrodes in the literature. The cases on ‘pure’ hematite electrodes are marked in gray.

Characteristics	Technique	Dopant	Thickness	Processing temperature	Photocurrent (mA /cm ²)	Ref
Encapsulated/ Functionalized porous	Solution-based method	Ti	N/A	800 °C	2.34 (1430 mv V vs. RHE)	1
Mesoporous	Colloidal nanocrystal solution	Sn	250 nm	820 °C	0.68 (1.43 V vs. RHE)	2
Zr doped nanoporous	Spray deposition	1% Zr	810 nm	500 °C	0.42 (0.6 V vs.. SCE)	3
		none	850 nm		~0	
Si doped Nanoporous	Spin coating	0.5% Si	~200 nm	500 °C	0.035 (1.23 V vs. RHE)	4
		none			<0.01	
Zn treated nanoporous	Electro- deposition	Zn	N/A	520 °C	~0.035 (0.4 V vs. Ag/AgCl)	5
		none			~0.01	
Nanoporous	Sol-gel		300 nm	750 °C	0.16 (1 V vs. Ag/AgCl)	6
Ti doped nanoporous	Spray- pyrolysis	Ti	N/A	350 °C	1.98 (0.5 V vs.. SCE)	7
		none			0	
Mesoporous/SnO ₂ underlayer	Spin coating	none	175 nm	400 °C	0.045 (0.5 V vs. Ag/AgCl)	This work
		none; triple layer		400 °C	0.12 (0.5 V vs. Ag/AgCl)	

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