

## Supporting information

# Enhanced Adsorption of Oxygen Species on c/h-In<sub>2</sub>O<sub>3</sub> Z-scheme Heterophase Junctions for Oxygen-mediated Photocatalytic Hydrogen Production

*Zhengxin Peng,<sup>[a]</sup> Xiangbowen Du,<sup>[b]</sup> Nan Lu,<sup>[a,b]</sup> Jing Sui,<sup>[a]</sup> Xiaofan Zhang,<sup>[a]</sup>  
Renhong Li,<sup>[b]</sup> and Xiaoqing Yan<sup>\*[a]</sup>*

[a] Department of Chemistry, School of Science, Zhejiang Sci-Tech University,  
Hangzhou, 310018, PR China.

[b] National Engineering Lab for Textile Fiber Materials and Processing Technology,  
School of Materials Science & Engineering, Zhejiang Sci-Tech University,  
Hangzhou, 310018, PR China.

### **\*Corresponding Authors**

*E-mail: yanxiaoqing927@126.com (X.Q. Yan)*

Table S1. Comparison of the photocatalytic hydrogen evolution activity over different heterophase junction photocatalysts under visible light irradiation.

Photocatalyst	Mass (mg)	Cocatalyst	Reactants and Concentration	Photocatalytic Activity ( $\mu\text{mol h}^{-1} \text{g}^{-1}$ )	Ref
rh/c-In <sub>2</sub> O <sub>3</sub> (MOF)	100	none	15 vol% triethanolamine	2244	1
Phase junction TiO <sub>2</sub>	10	none	10 vol% CH <sub>3</sub> OH	80	2
orthorhombic/hexagonal WO <sub>3</sub>	50	none	Na <sub>2</sub> S (0.35 M) + Na <sub>2</sub> SO <sub>3</sub> (0.25 M)	708	3
Anatase/Brookite TiO <sub>2</sub>	100	Pt (1.0 wt%)	10 vol% CH <sub>3</sub> OH	3423	4
Anatase/Rutile TiO <sub>2</sub>	100	Pt (1.0 wt%)	10 vol% CH <sub>3</sub> OH	1453	4
tri-/tri-s-tri C <sub>3</sub> N <sub>4</sub>	50	Pt (3.0 wt%)	10 vol% triethanolamine	2880	5
hexagonal/g-C <sub>3</sub> N <sub>4</sub>	30	Pt (10 wt%)	20 vol% triethanolamine	4000	6
c/h-In <sub>2</sub> O <sub>3</sub>	20	none	3 M HCHO and 5 M NaOH	730	this work

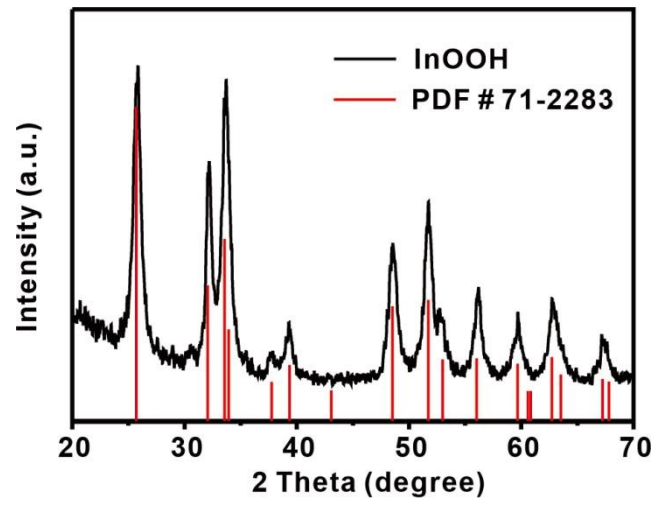


Figure S1. XRD of the InOOH precursor.

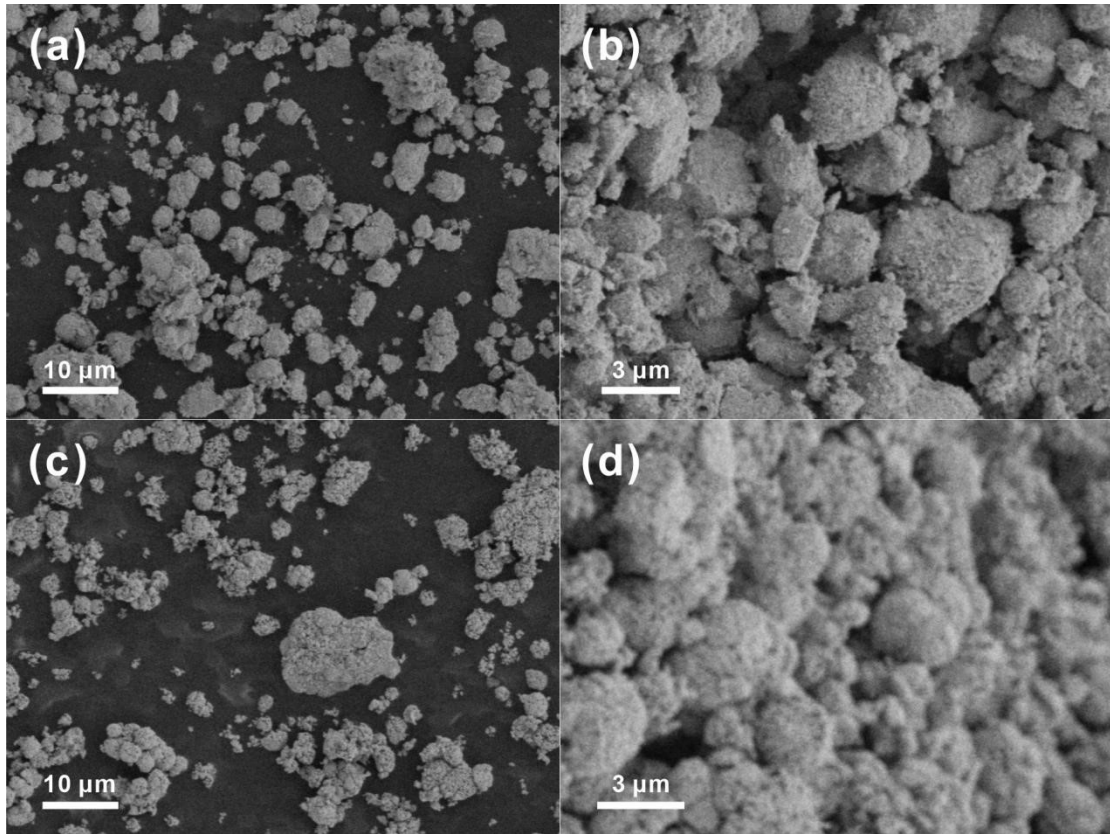


Figure S2. SEM of the (a,b) h-In<sub>2</sub>O<sub>3</sub> and (c,d) c-In<sub>2</sub>O<sub>3</sub>.

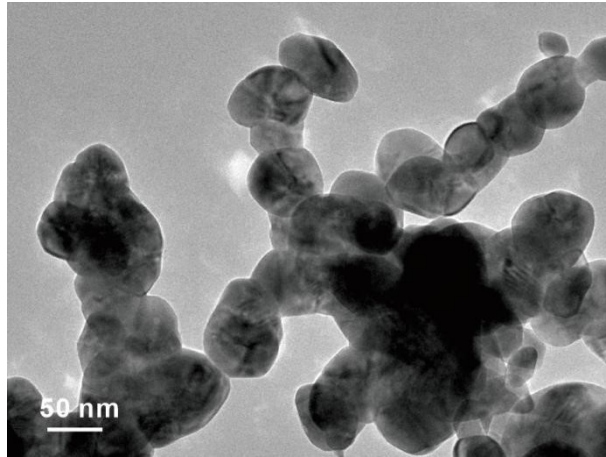


Figure S3. TEM of c/h-In<sub>2</sub>O<sub>3</sub>.

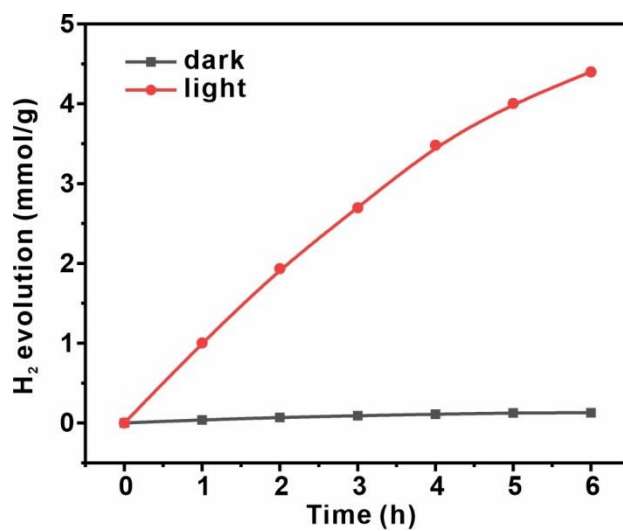


Figure S4. The time profiles of hydrogen production from c/h-In<sub>2</sub>O<sub>3</sub> suspending in an aqueous solution containing 3 M HCHO and 5 M NaOH at 0.21 O<sub>2</sub> atm, under dark and light conditions.

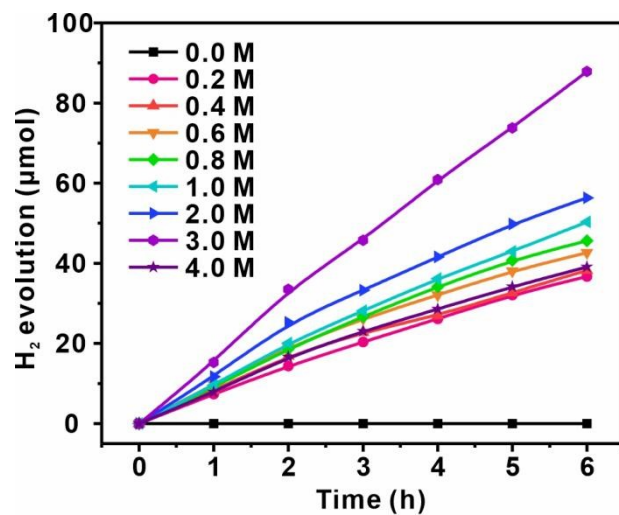


Figure S5. The time profiles of hydrogen production from c/h-In<sub>2</sub>O<sub>3</sub> suspending in an aqueous solution containing 5 M of NaOH and different concentrations of HCHO at 0.21 O<sub>2</sub> atm under visible-light irradiation ( $\lambda > 420$  nm).

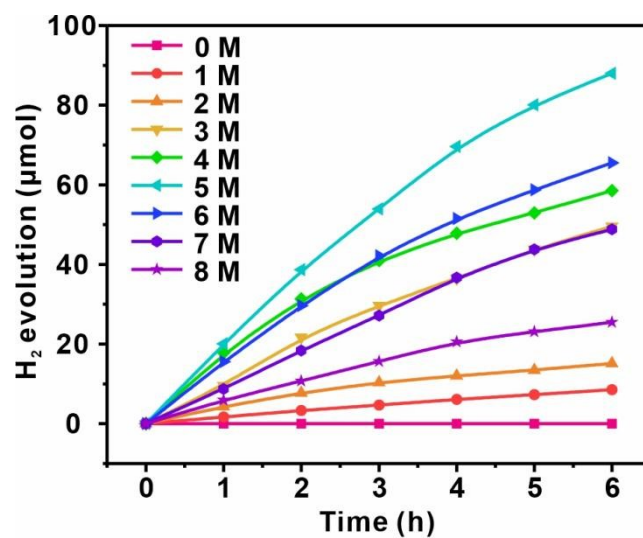


Figure S6. The time profiles of hydrogen production from c/h-In<sub>2</sub>O<sub>3</sub> suspending in an aqueous solution containing 3 M of HCHO and different concentrations of NaOH at 0.21 O<sub>2</sub> atm under visible-light irradiation ( $\lambda > 420$  nm).



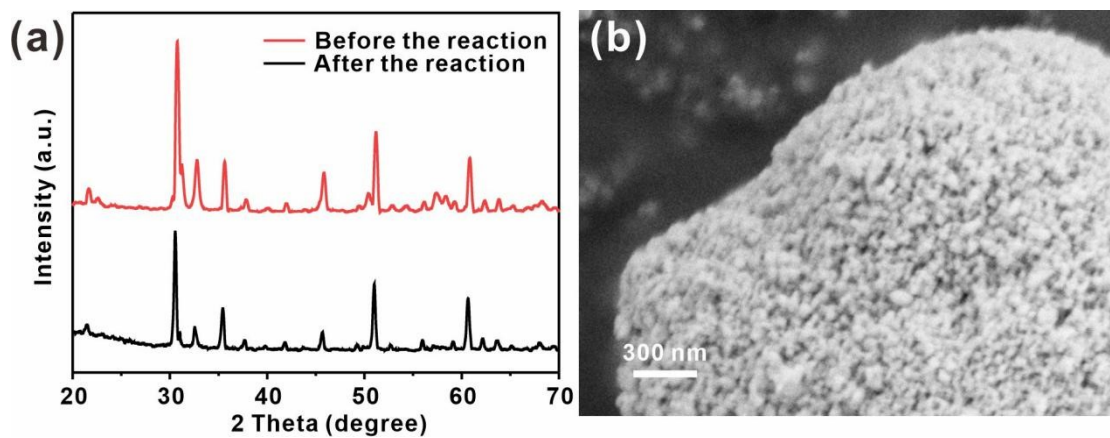


Figure S7. (a) XRD and (b) SEM of c/h-In<sub>2</sub>O<sub>3</sub> sample after 5 cycles of illumination.

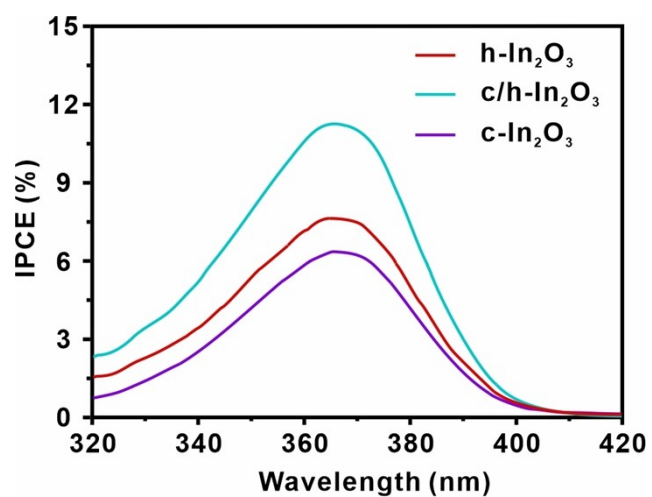


Figure S8. Incident photon to converted electron spectra (IPCE) of h-In<sub>2</sub>O<sub>3</sub>, c/h-In<sub>2</sub>O<sub>3</sub> and c-In<sub>2</sub>O<sub>3</sub>.

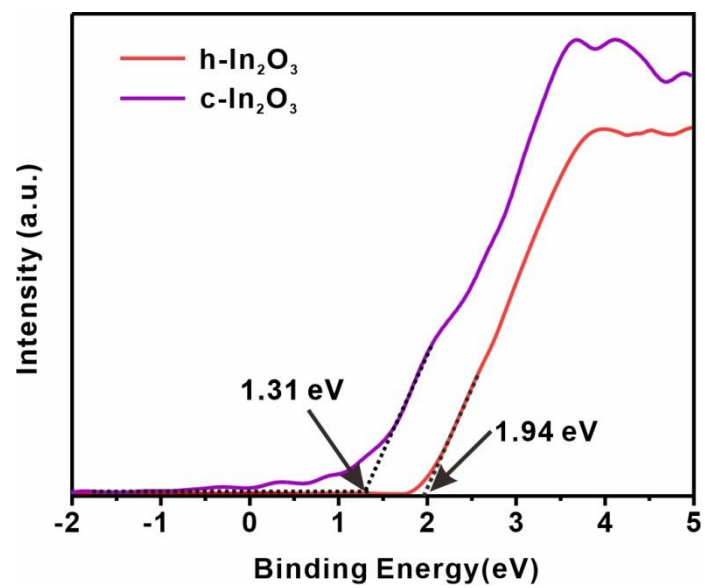


Figure S9. XPS valence band spectra of h-In<sub>2</sub>O<sub>3</sub> and c-In<sub>2</sub>O<sub>3</sub>.

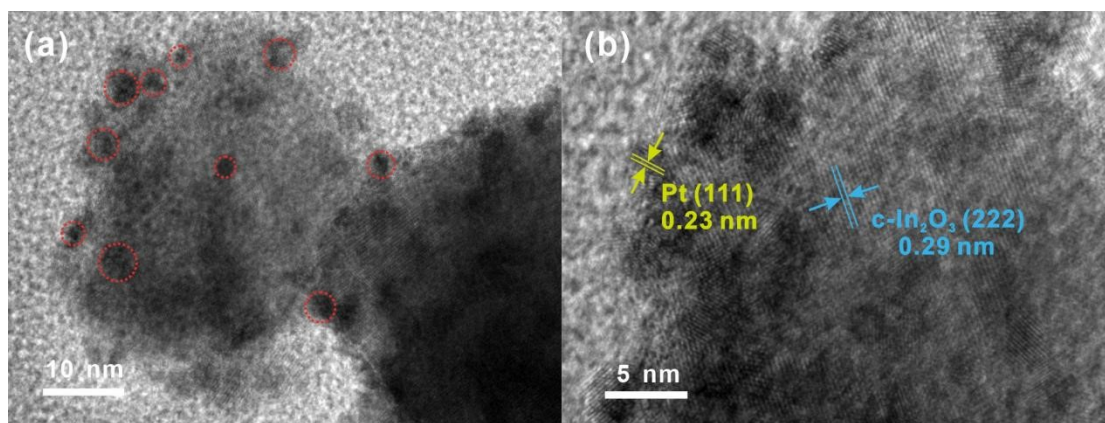


Figure S10. (a) TEM images of c/h-In<sub>2</sub>O<sub>3</sub> after photoreduction deposition of Pt nanoparticles, (b) HRTEM image of c/h-In<sub>2</sub>O<sub>3</sub> after photoreduction deposition of Pt nanoparticles.

## References:

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