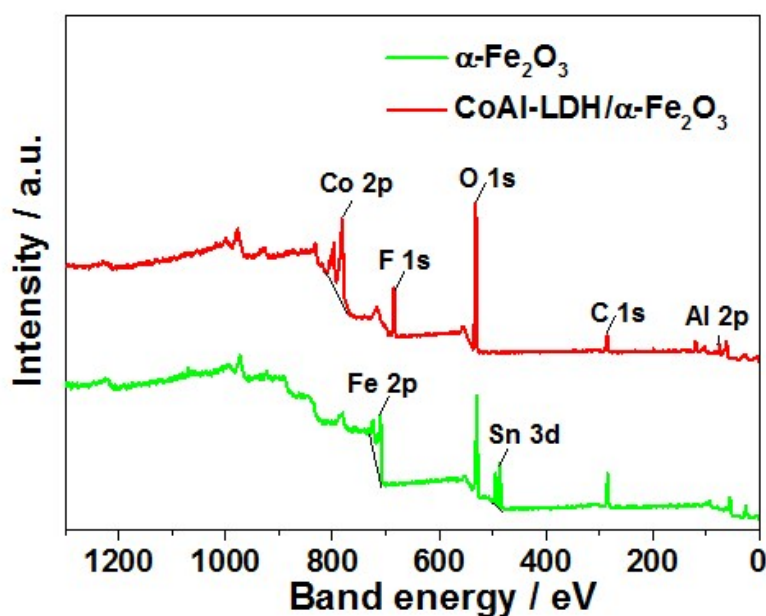


## Electronic Supplementary Information

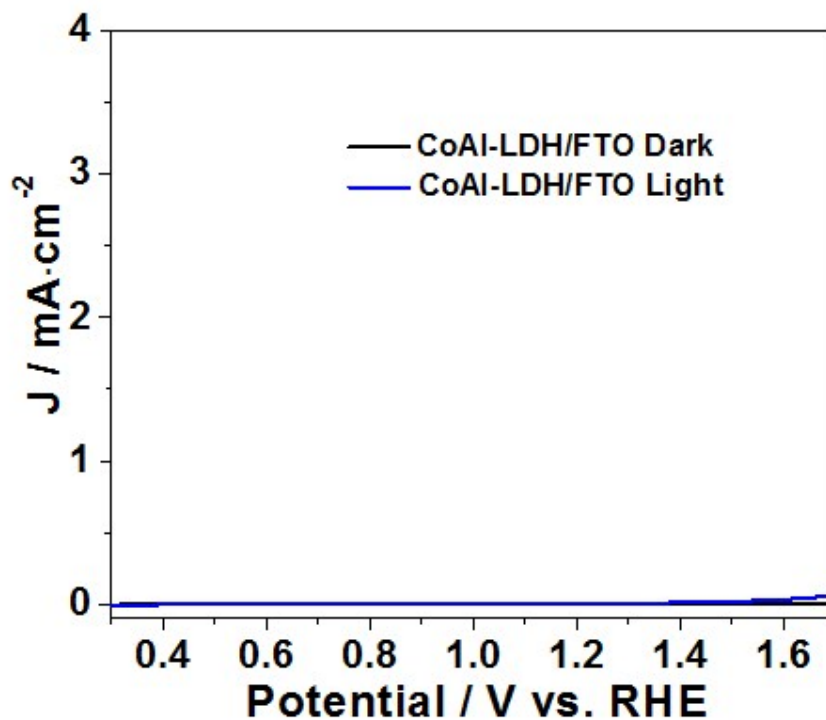
### Dual-functional CoAl Layered Double Hydroxide Decorated $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> as Efficient and Stable Photoanode for Photoelectrochemical Water Oxidation in Neutral Electrolyte

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and Ling Zhang\*

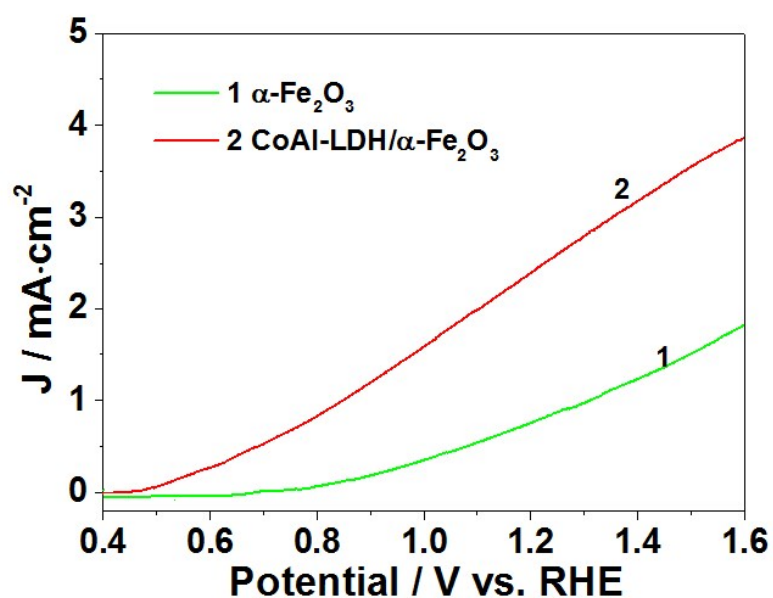
*Institute of Environmental and Analytical Sciences, College of Chemistry and Chemical  
Engineering, Henan University, Kaifeng 475004, China.*



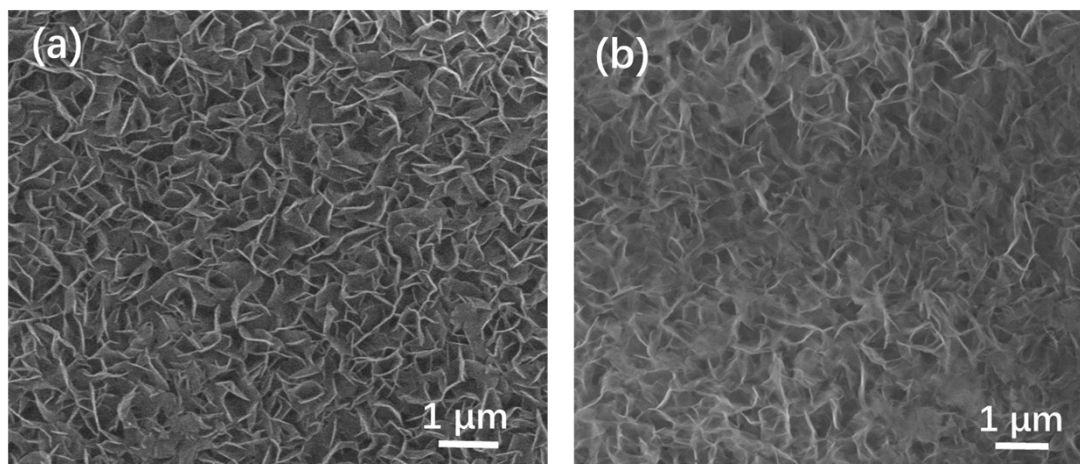
**Fig. S1** XPS analysis of bare  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.



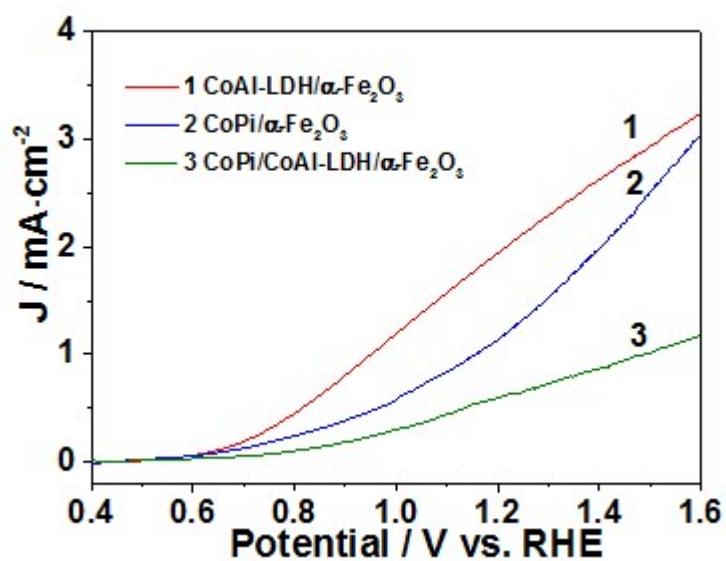
**Fig. S2** LSV curves of CoAl-LDH/FTO under AM 1.5G or in dark. Conditions: 0.1 mol·L<sup>-1</sup> Na-Pi solution (pH 7), and 20 mV·s<sup>-1</sup> scan rate.



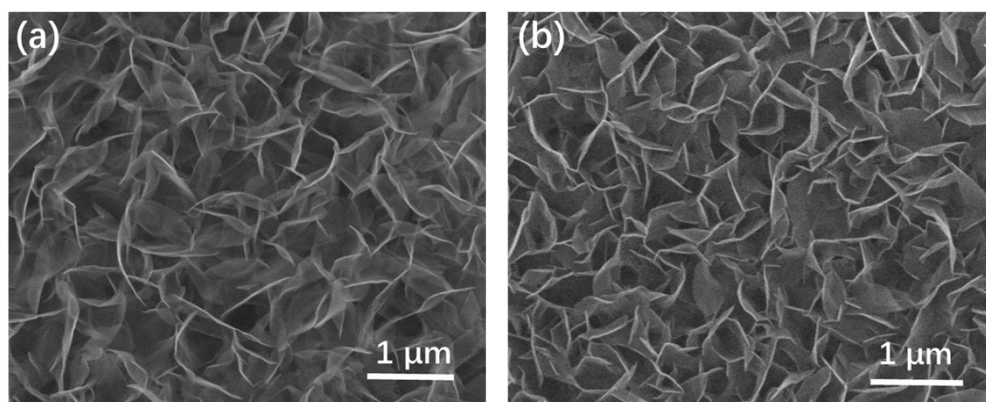
**Fig. S3** LSV curves of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> under AM 1.5G in the presence of 0.5 mol·L<sup>-1</sup> H<sub>2</sub>O<sub>2</sub>. Conditions: 0.1 mol·L<sup>-1</sup> Na-Pi solution (pH 7), and 20 mV·s<sup>-1</sup> scan rate.



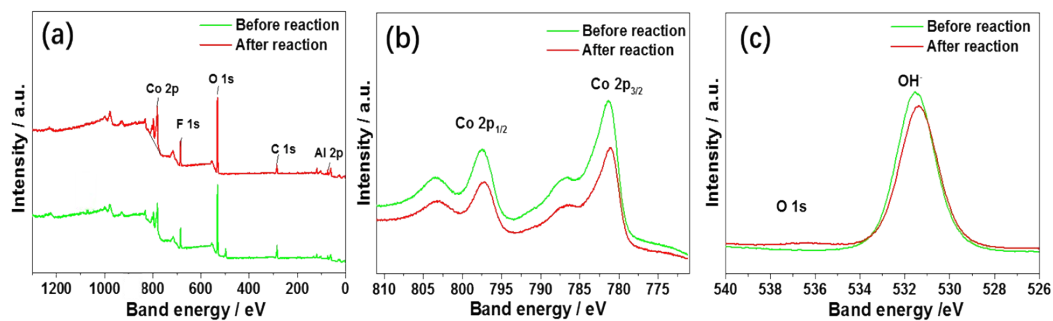
**Fig. S4** Top view SEM images of (a) CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and (b) CoPi/CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.



**Fig. S5** LSV curves of CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, CoPi/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and CoPi/CoAl-LDH/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> under AM 1.5G. Conditions: 0.1 mol·L<sup>-1</sup> Na-Pi solution (pH 7), and 20 mV·s<sup>-1</sup> scan rate.



**Fig. S6** Top view SEM images of CoAl-LDH/α-Fe<sub>2</sub>O<sub>3</sub> (a) before and (b) after 2 h PEC test.



**Fig. S7.** XPS spectra of (a) full survey, (b) Co 2p and (c) O1s of CoAl-LDH/α-Fe<sub>2</sub>O<sub>3</sub> before and after 2 h PEC test.