Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting information

Loading FeNiOOH Cocatalyst on Pt-modified Hematite Nanostructures for Efficient Solar Water Oxidation

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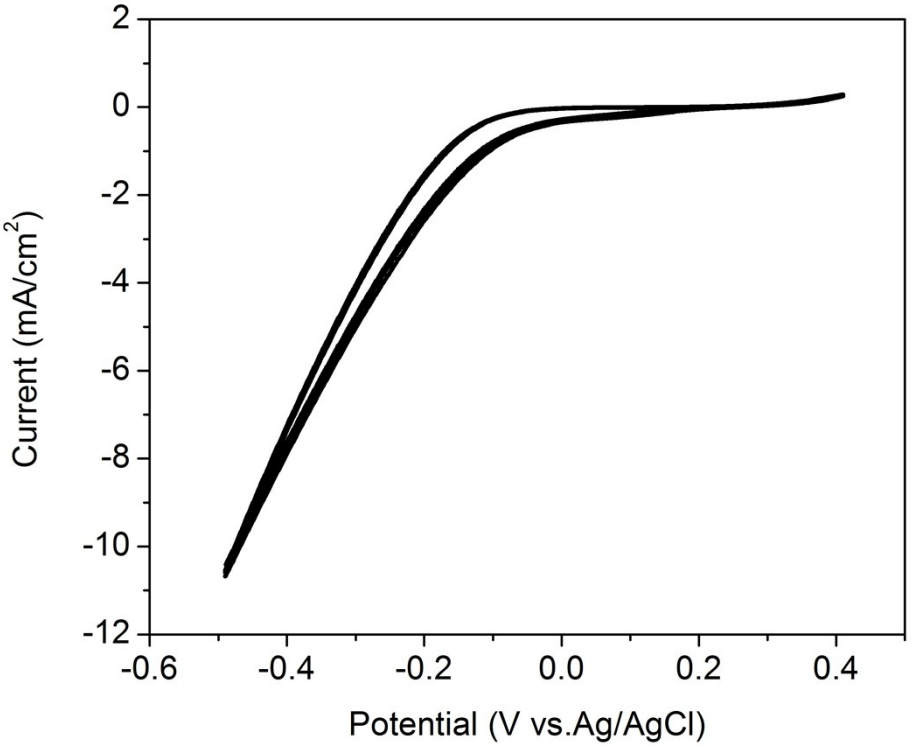

Fig. S1: Cyclic-voltammetry (CV) curves for the electrodeposition of FeNiOOH on hematite nanostructures.

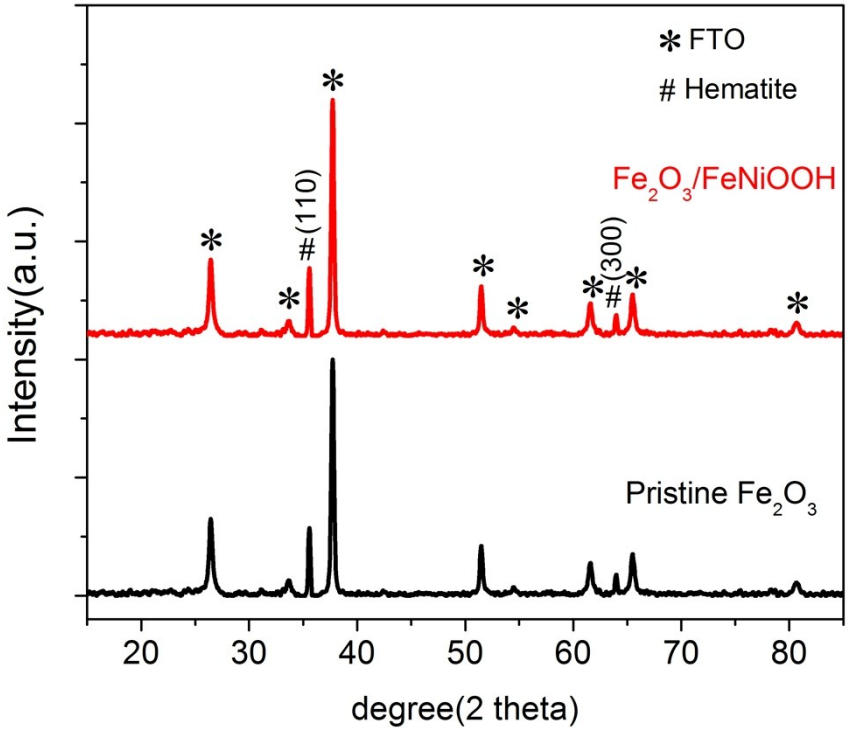

Fig. S2: XRD spectra of the pristine and FeNiOOH-decorated hematite nanostructures.

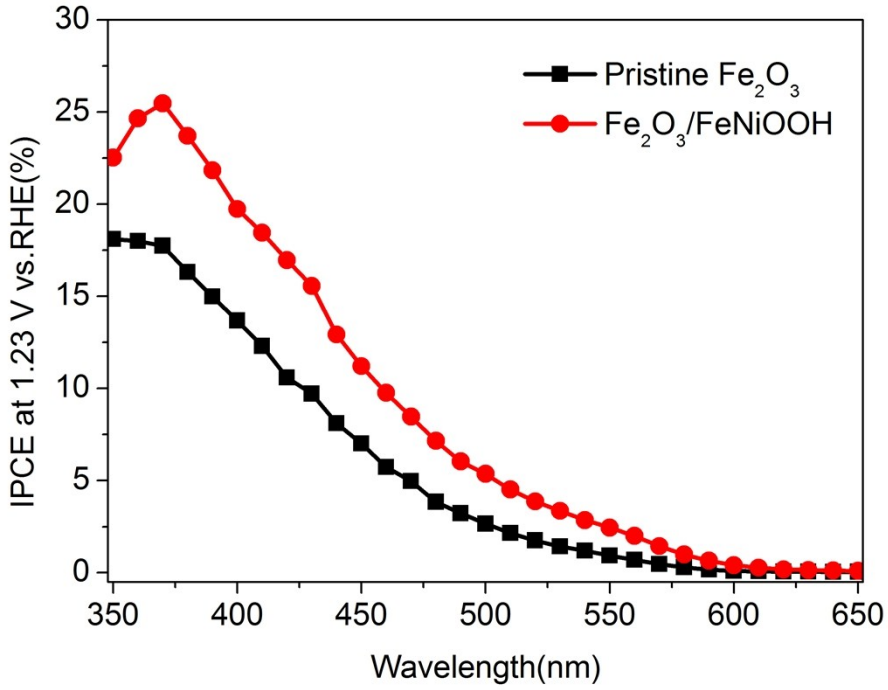

Fig. S3: IPCE curves of the pristine and FeNiOOH-decorated hematite photoanodes.

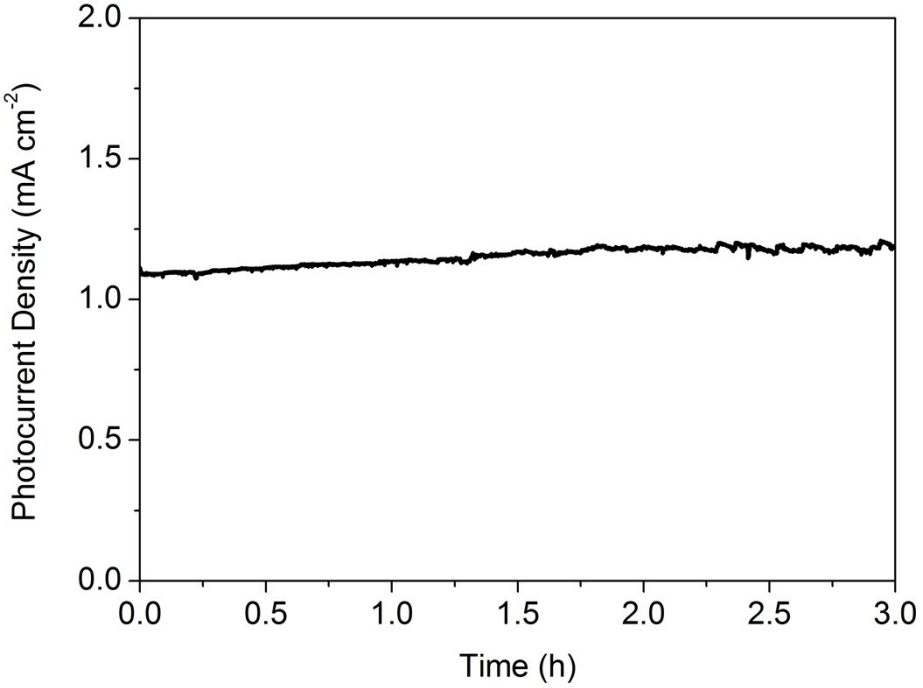

Fig. S4: Photochemical stability curve of the FeNiOOH-decorated hematite photoanode collected at 1.23 V *vs.* RHE.

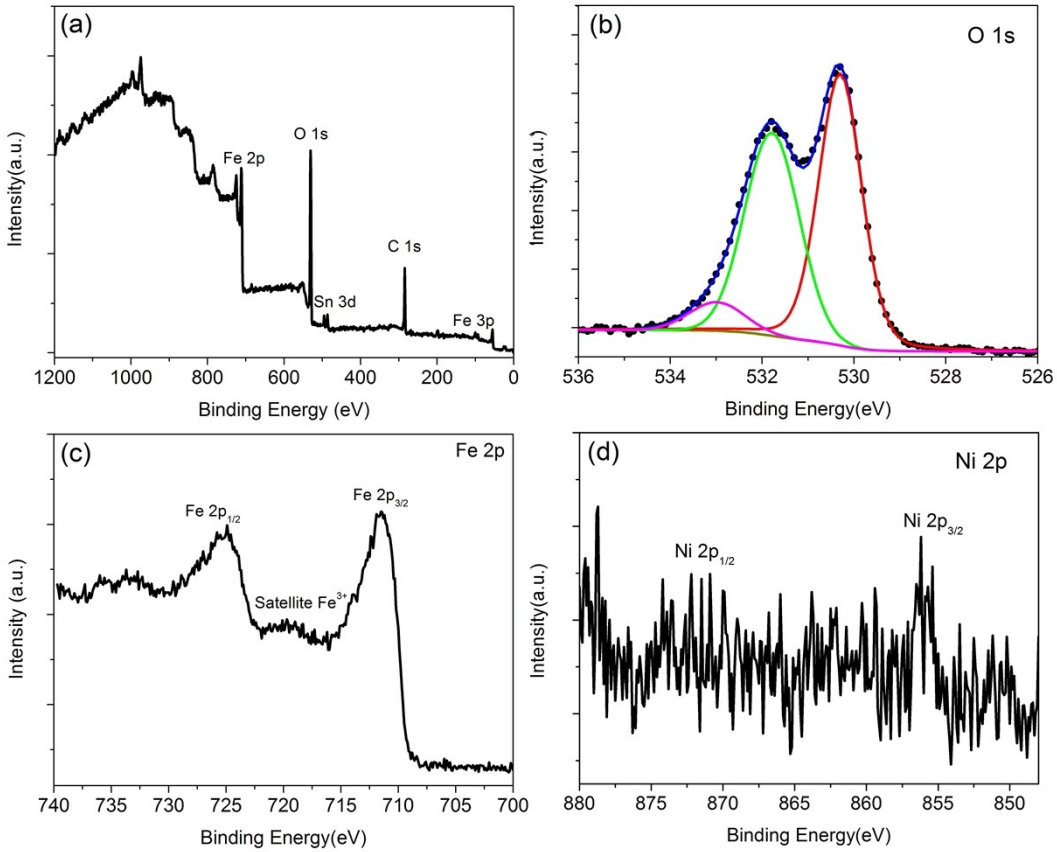

Fig. S5: (a) XPS survey spectrum of the FeNiOOH-decorated hematite photoanode. High-resolution O 1s (b), Fe 2p (c), and Ni 2p (d) XPS spectra of the FeNiOOH-decorated hematite photoanode.

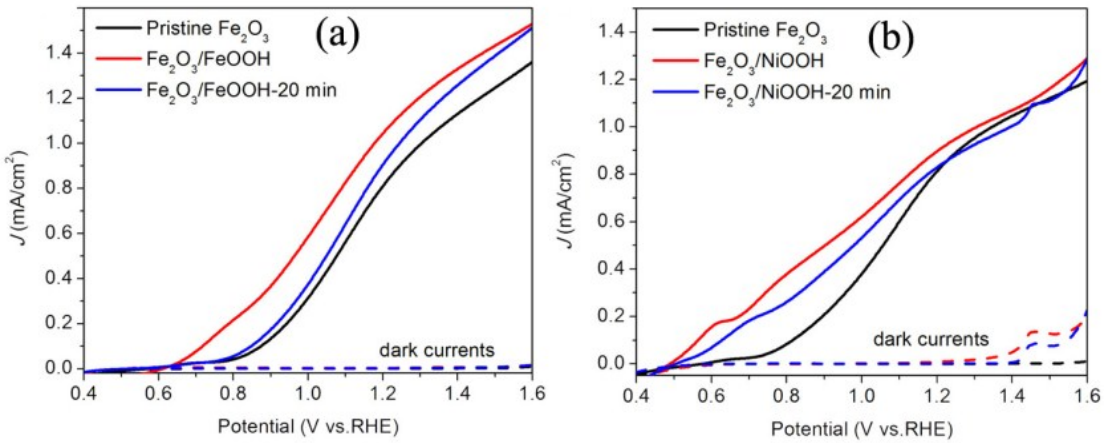

Fig. S6: (a) *J–V* curves of the pristine and FeOOH-decorated hematite photoanodes. (b) *J–V* curves of the pristine and NiOOH-decorated hematite photoanodes.

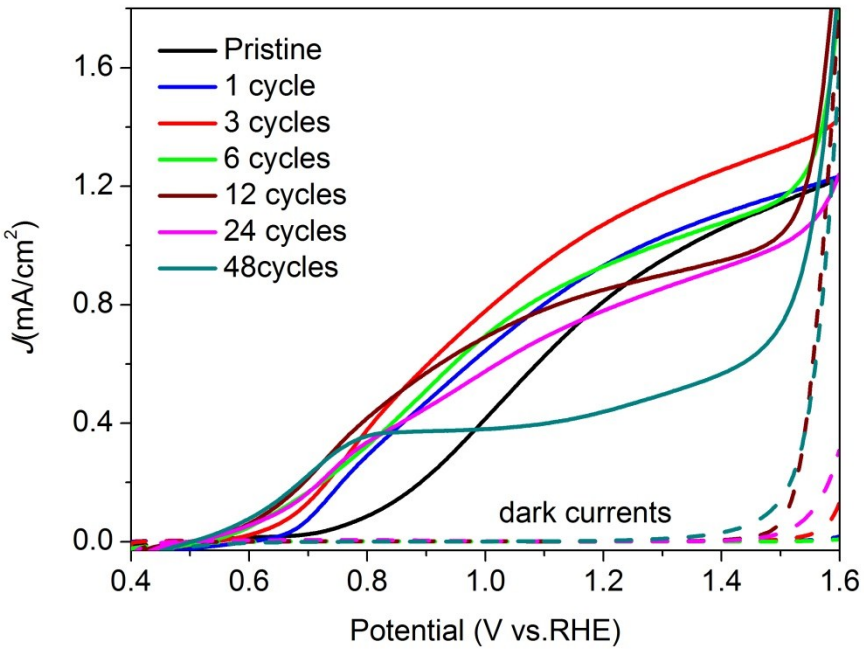

Fig. S7: *J–V* curves of the pristine and FeNiOOH-decorated hematite photoanodes with various deposition cycles.

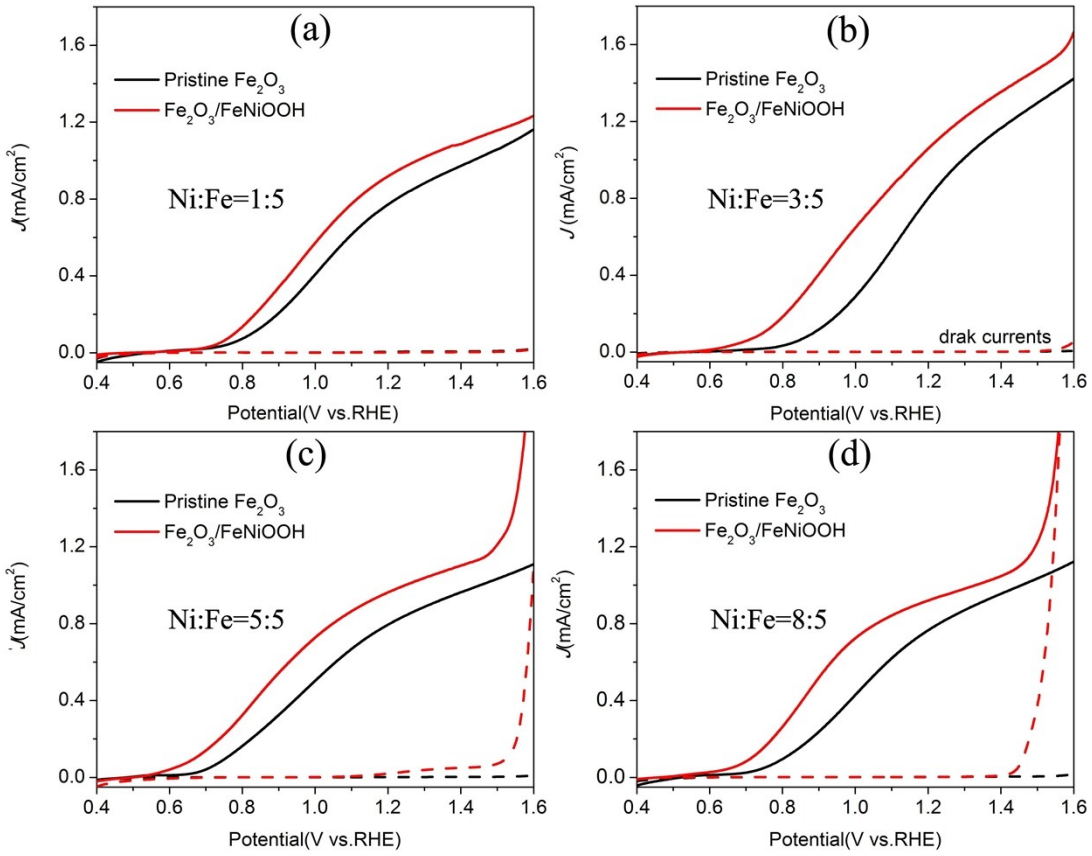

Fig. S8: *J–V* curves of the pristine and FeNiOOH-decorated hematite photoanodes with various concentrations of the precursors: (a) Ni:Fe=1:5; (b) Ni:Fe=3:5; (c) Ni:Fe=5:5; (d) Ni:Fe=8:5.

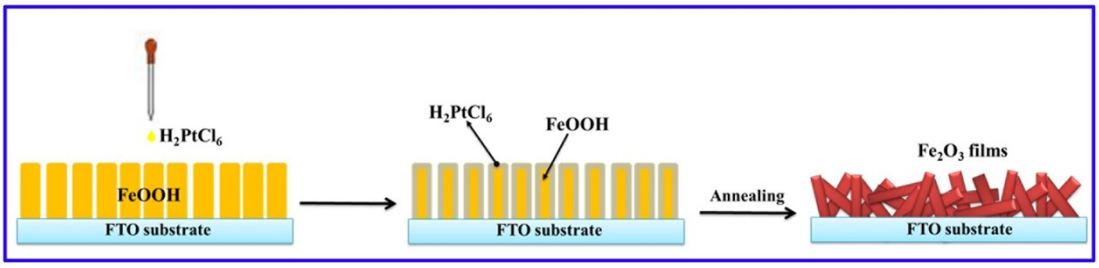

Fig. S9: Experimental setup for the decoration of Pt in the hematite photoanode.

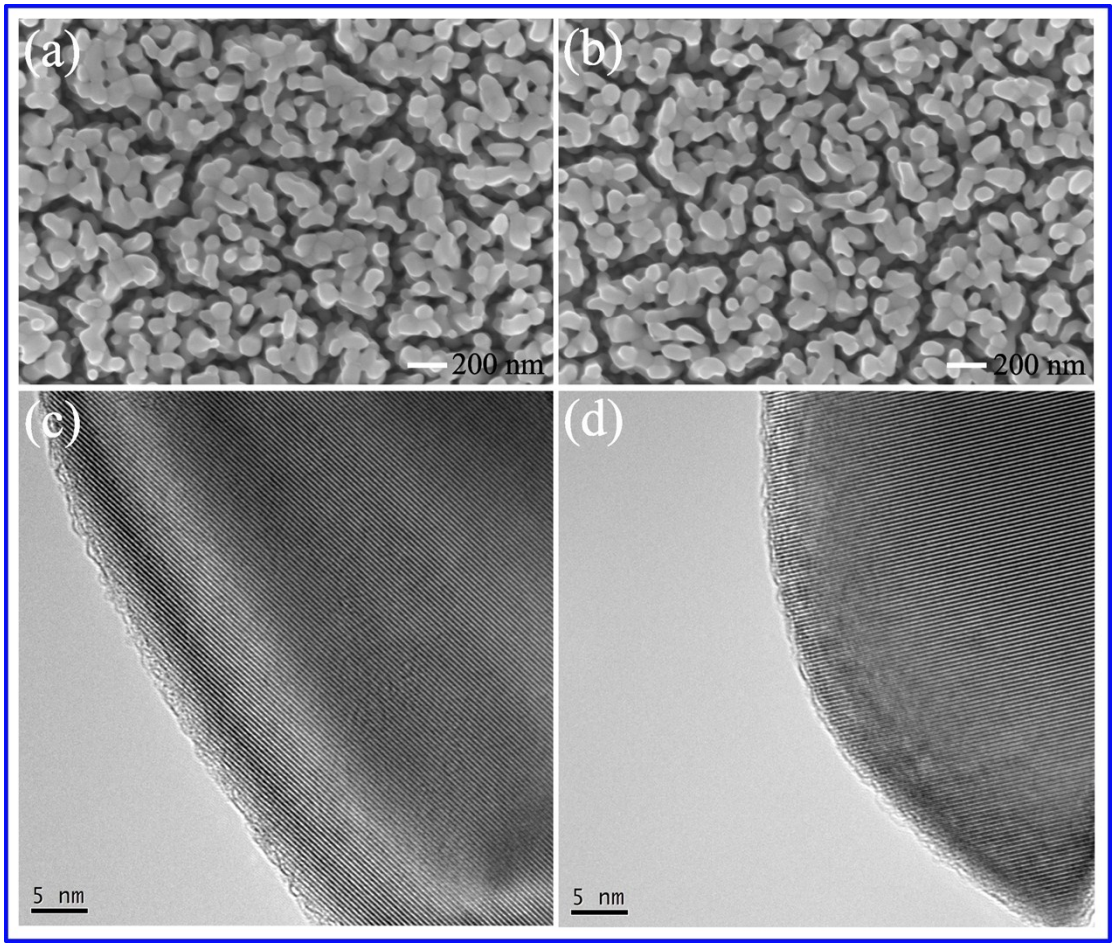

Fig. S10: (a) and (c): SEM and HRTEM images of the pristine hematite nanostructures. (b) and (d): SEM and HRTEM images of the Pt-modified hematite nanostructures.

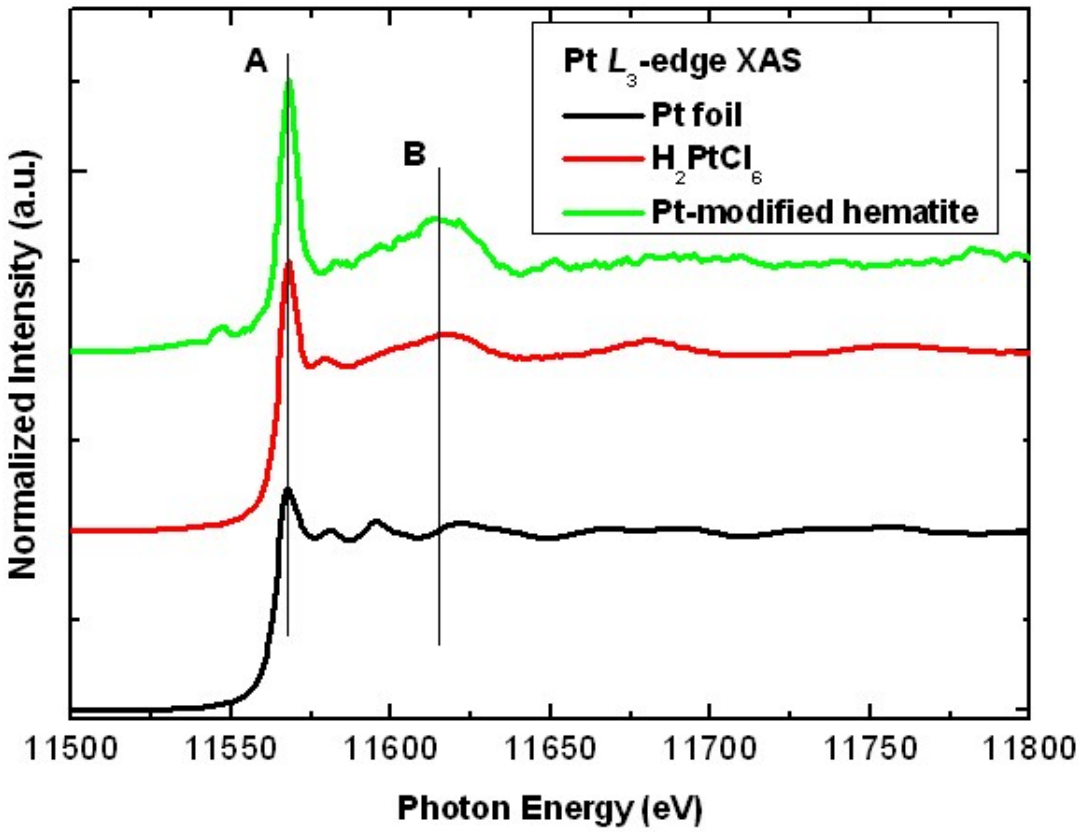

Fig. S11: Pt L_3-edge XAS spectra of the Pt foil, H_2PtCl_6 and Pt-modified hematite nanostructures. The spectrum of the Pt-modified hematite shows a sharp white line peak A and a broad peak B, which is very similar to oxidized Pt such as H_2PtCl_6 or PtO_2 instead of the metallic Pt.

Table S1: Parameters of equivalent circuit elements.

	R_s	C_{bulk}	R_{trap}	C_{trap}	R_{ct}
Pristine Fe_2O_3	11.26	1.376E-5	269.5	1.603E-4	406.5
Pt-Fe_2O_3	15.93	8.454E-5	59.98	4.540E-4	205.8
Pt-Fe_2O_3/FeNiOOH	16.06	6.053E-5	73.1	1.128E-3	61.5

Illustration of the parameters: R_s is the series resistances of the PEC cell. C_{bulk} is the capacitance of the space charge depletion region at the surface of the electrode. The surface hole trapping process can be reflected by R_{trap} and C_{trap}, R_{trap} is the resistance in the process of trapping holes by surface states, the amount of active sites in surface states is denoted as C_{trap}. The resistance in the process of charge transfer across the interface could be described by R_{ct}. (Ref. 37)