Supporting Information

Pt (111) quantum dots decorated flower-like αFe_2O_3 (104) thin film nanosheets as highly efficient bifunctional electrocatalyst for overall water splitting

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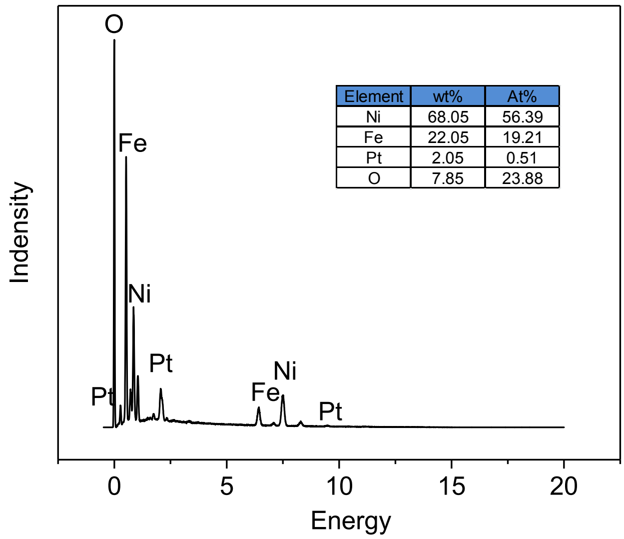

Figure S1 EDS image of Pt-αFe_2O_3/NF.

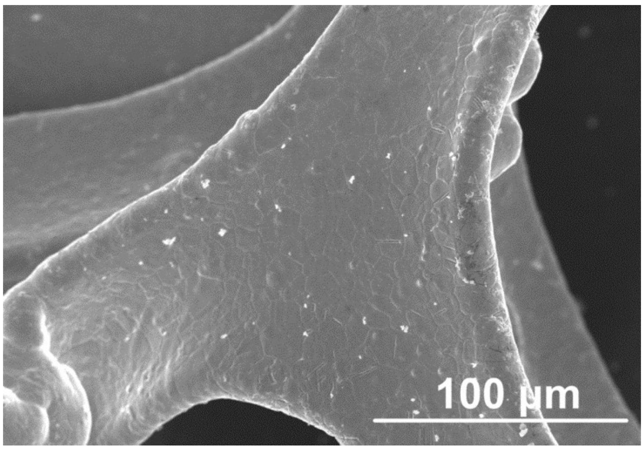

Figure S2 FSEM images of Pt /NF.

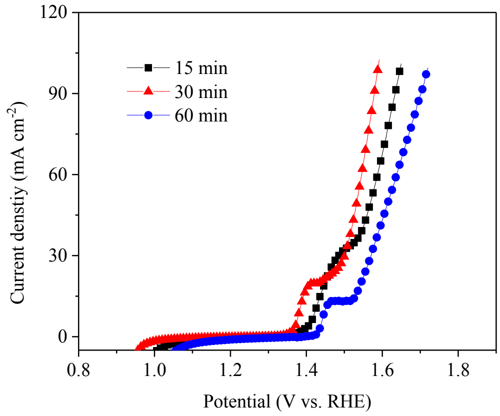

Figure S3 OER electrocatalytic activity of Pt-αFe_2O_3/NF obtained from different electrodeposition times.

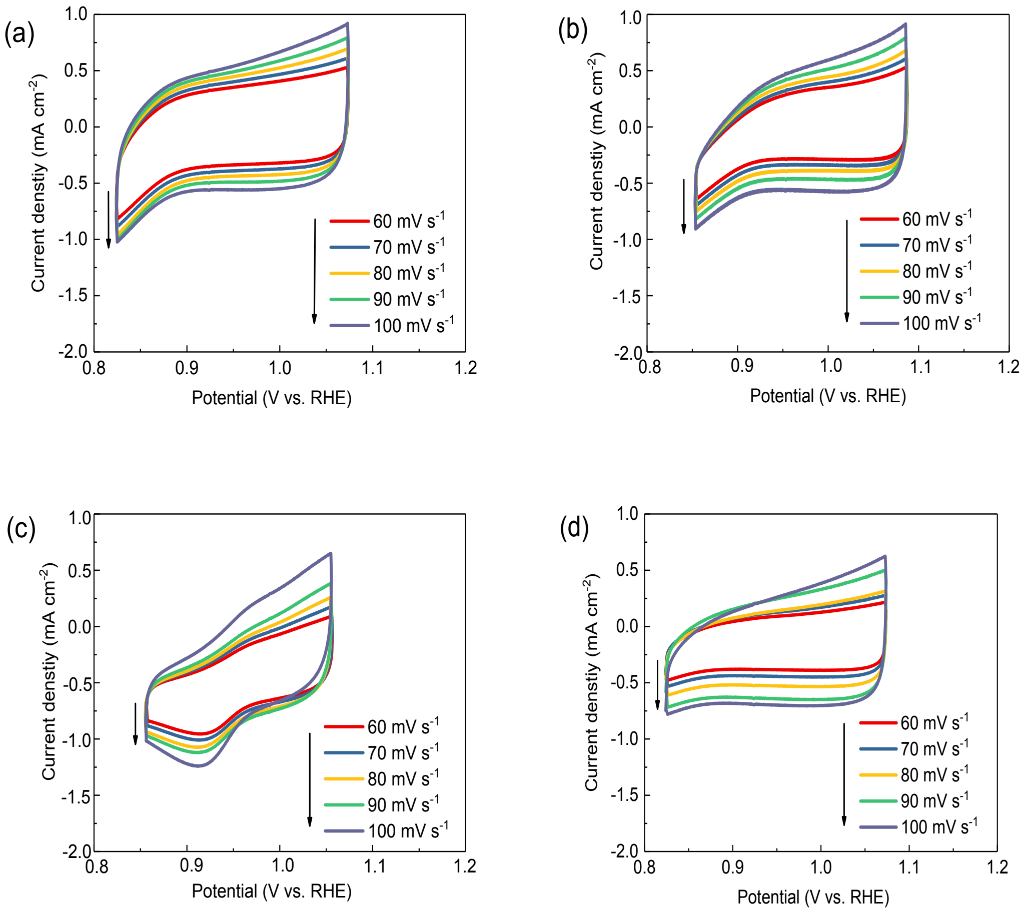

Figure S4 CV of (a) Pt-αFe_2O_3/NF, (b) αFe_2O_3/NF,(c) Pt /NF,(d)NF.

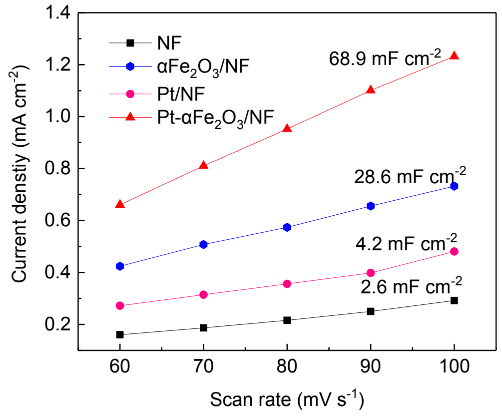

Figure S5 C_{dl} of NF, αFe_2O_3/NF, Pt/NF and Pt-αFe_2O_3/NF.

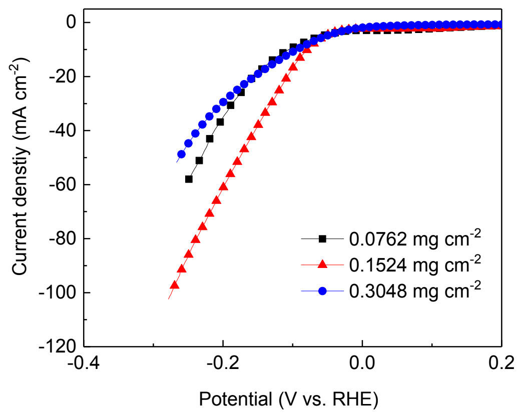

Figure S6 HER electrocatalytic activity of Pt-αFe_2O_3/NF with different amounts of Pt quantum dots loading.

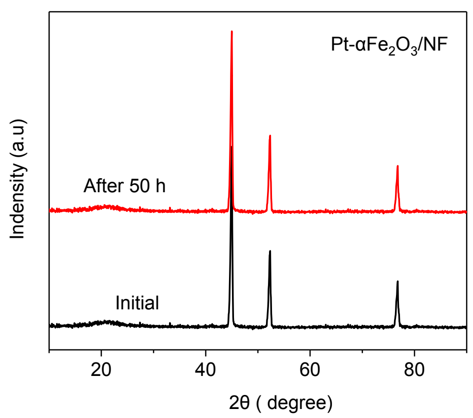

Figure S7 XRD patterns of Pt-αFe_2O_3/NF in initial and after working for 50h.

Table S1 Comparison of theoretical Pt loading and experimental Pt loading on both Pt/NF and Pt-αFe_2O_3/NF electrodes.

Electrode	Theoretical Pt loading ($mg\ cm^{-2}$)	Experimental Pt loading ($mg\ cm^{-2}$)
Pt/NF	0.1951	0.0503
Pt-αFe_2O_3/NF	0.1951	0.1524

Table S2 Fitting results of various resistances of oxygen evolution system with different electrodes.

	$R_s(\Omega)$	$R_{ct}(\Omega)$	$R_{int}(\Omega)$
NF	0.92	25.17	26.09
αFe_2O_3/NF	0.87	9.19	10.06
Pt/NF	1.01	17.02	18.03
Pt-αFe_2O_3/NF	0.87	7.14	8.01

Table S3 Fitting results of various resistances of hydrogen evolution system with different electrodes.

	$R_s(\Omega)$	$R_{ct}(\Omega)$	$R_{int}(\Omega)$
NF	1.08	16.06	17.14
αFe_2O_3/NF	0.98	7.20	8.18
Pt/NF	1.25	11.44	12.69
Pt-αFe_2O_3/NF	0.80	0.81	1.61

Table S4 Different materials and Pt-αFe_2O_3/NF electrodes for OER, HER and overall water splitting.

Catalyst	Electrolyte	Overpotential (mV) for OER at a specific current density(mA cm^{-2})	Overpotential (mV) for HER at a specific current density(mA cm^{-2})	Overpotential (V) for overall water splitting at a specific current density(mA cm^{-2})	Pt wt% (EDS)	Ref
IrPt	0.5M H_2SO_4	8@320	-	-	56	[1]
Pt-Ni-Co	0.1M KOH	-	5 @22	-	85.61	[2]
Cu-Pt/NPCC	0.1M H_2SO_4	-	10@298	-	16.92	[3]
Pt-NiFe LDH-ht	1M KOH	10@230	10@101	1.505	1.51	[4]
Pt-αFe_2O_3/NF	1M KOH	10@153	10@90	1.51	2.05	This work
Ti/IrO_2-Ta_2O	0.5M H_2SO_4	12@170	-	-	-	[5]
NiSe/NF	1M KOH	10@271	10@137	1.69	-	[6]
CoFe/NF	1M KOH	100@230	100@160	1.68	-	[7]
CdS/Ni_3S_2/PNF	1M KOH	100@400	10@121	-	-	[8]
P-Co_3O_4/NF	1M KOH	20@260	10@97	1.63	-	[9]
Co_3S_4@MoS_2	0.5M H_2SO_4	10@330	10@210	1.58	-	[10]
NiFe-oxide	1M KOH	10@339	10@347	1.67	-	[11]
$MoWS_2$@Ni_3S_2	1M KOH	10@285	10@98	1.62	-	[12]
FeCoO-NF	1M KOH	10@224	10@205	1.62	-	[13]
Fe-NiO/NF	1M KOH	10@206	10@88	1.579	-	[14]

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