Supporting information

Ru, B Co-doped Hollow Structured Iron Phosphide as Highly Efficient Electrocatalyst toward Hydrogen Generation in Wide pH Range

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Physical Characterization

The morphology and lattice striations of the catalysts were characterized by scanning electron microscopy (SEM) and transmission electron microscopy (TEM) and high-resolution transmission electron microscopy (HRTEM), the crystal structure of the catalysts was determined by X-ray diffraction (XRD) and the elemental composition of the catalysts was studied by X-ray photoelectron spectroscopy (XPS), the elemental distribution of the catalyst was characterized using an energy dispersive X-ray spectrometer (EDX).

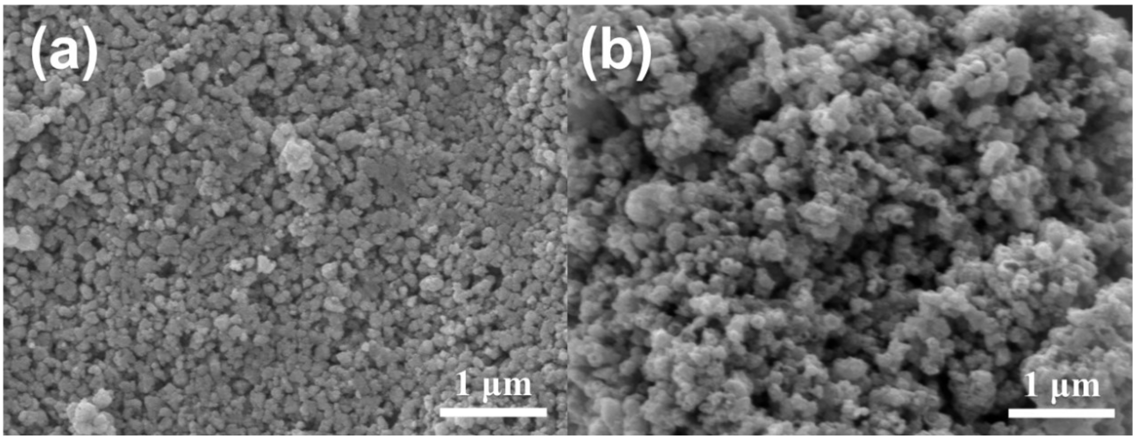

Fig. S1. SEM images of a) B/Ru-FeP. b) H-B/Ru-FeP.

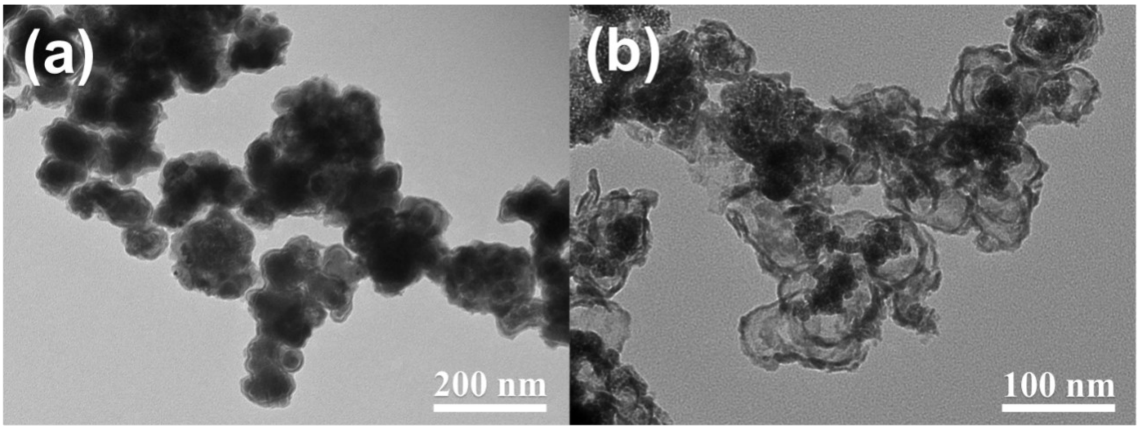

Fig. S2. TEM images of a) B/Ru-FeP. b) H-B/Ru-FeP.

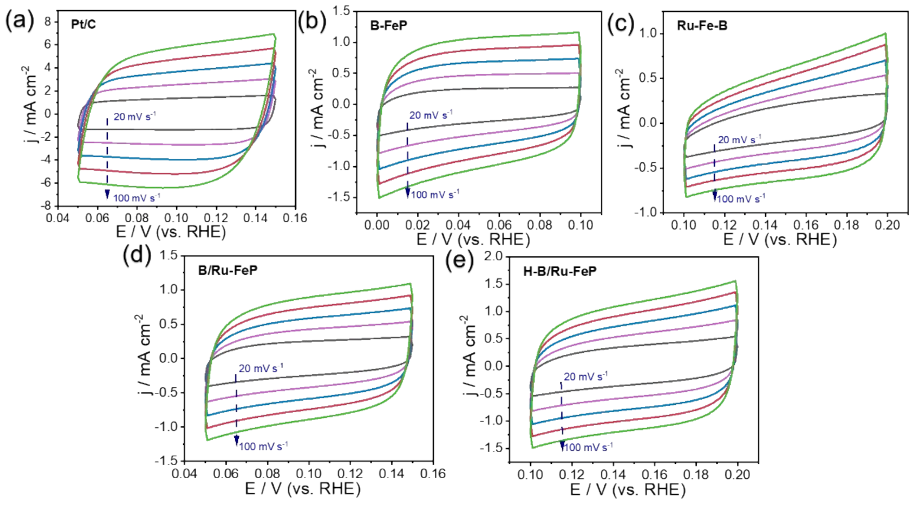

Fig. S3 Cyclic voltammetry profiles for (a) Pt/C (b) B-FeP (c) Ru-Fe-B (d) B/Ru-FeP and (e) H-B/Ru-FeP at different scan rates (20, 40, 60, 80 and 100 mVs^{-1}) in a 0.5 M H_2SO_4 solution.

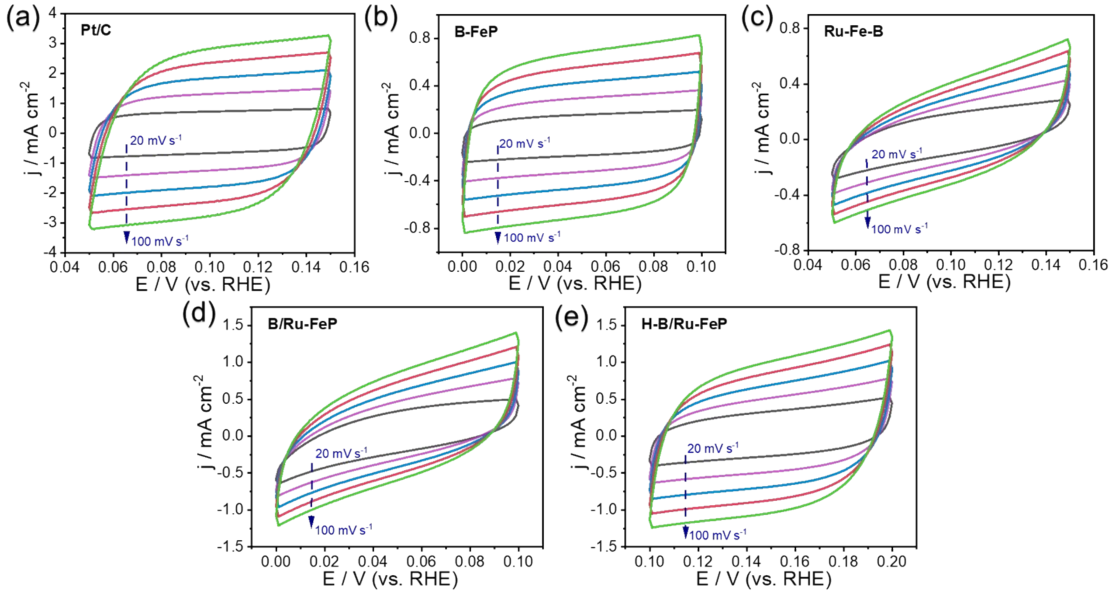

Fig. S4 Cyclic voltammetry profiles for (a) Pt/C (b) B-FeP (c) Ru-Fe-B (d) B/Ru-FeP and (e) H-B/Ru-FeP at different scan rates (20, 40, 60, 80 and 100 mVs^{-1}) in a 1 M PBS solution.

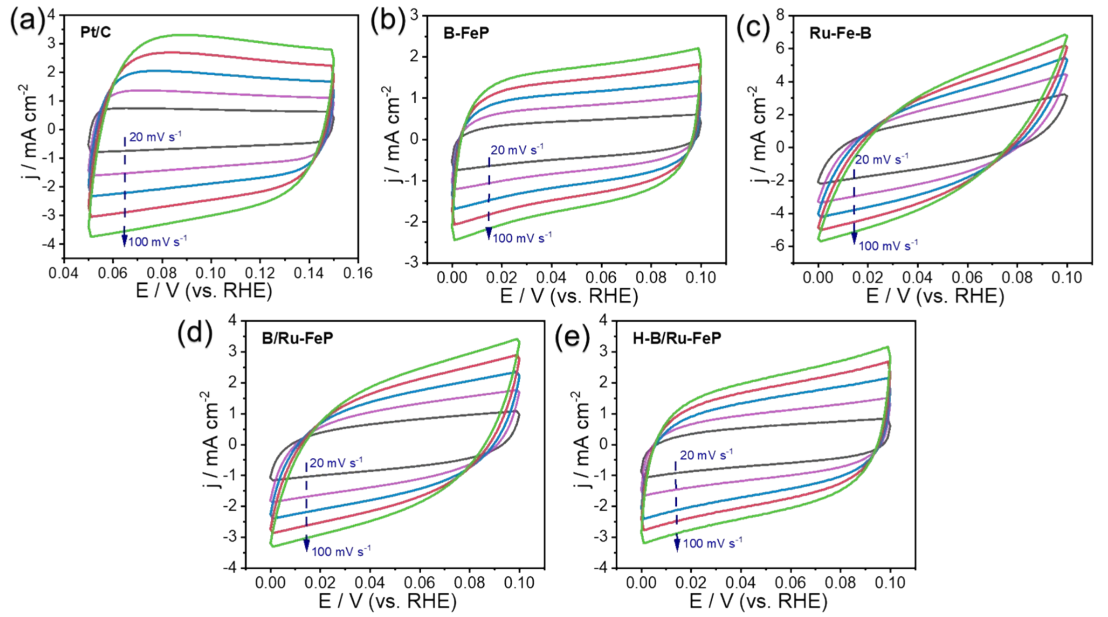

Fig. S5 Cyclic voltammetry profiles for (a) Pt/C (b) B-FeP (c) Ru-Fe-B (d) B/Ru-FeP and (e) H-B/Ru-FeP at different scan rates (20, 40, 60, 80 and 100 mVs^{-1}) in a 1 M KOH solution.

Table S1. Comparison of HER activity in 0.5 M H_2SO_4 for various electrocatalyts.

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Tafel slope (mV dec^{-1})	Reference
H-B/Ru-FeP	29 mV	35.2	This work
RuP_2@NPC	38 mV	38	1
FeP nanorod array	58 mV	45	2
FeP/CF	88 mV	35.5	3
Fe-P/WO_2	98 mV	47	4
Ru-MC	40 mV	42	5
RuFeP-NCs/CNF	65.8 mV	43.4	6
P-Ru/C	74 mV	51	7
Ni@Ni_2P-Ru	51 mV	35	8

Table S2. Comparison of HER activity in 1 M PBS for various electrocatalysts.

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Tafel slope (mV dec^{-1})	Reference
H-B/Ru-FeP	86	72.5	This work
FeP/NCNSs	205	70	[9]
Ni-FeP/C	117	70	[10]
0.02-Ru@CN-6	82	103	[11]
RuP@NPC	110	57	[12]
Ru-NiFeP/NF	105.1	82.7	[13]
$FePSe_3$/NC	140.1	167	[14]
Co-Fe-P	138	138	[15]
RuP_2@NPC	57	87	[1]

Table S3. Comparison of HER activity in 1 M KOH for various electrocatalyts.

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Tafel slope (mV dec^{-1})	Reference
H-B/Ru-FeP	110	76.7	This work
FeB_2 NPs	61	87.5	[16]
NiFeP@C	160	78.5	[17]
Ni_3FeN	185	112.7	[18]
Ni-Fe-P-350	182	85	[19]
Fe-Co_2P BNRs	156	90	[20]
P-Ru/C	31	105	[7]
FeP Nanocubes-CP	140	61.9	[18]
$FeCoP_2$@NPPC	150	79	[21]

Table S4. Comparison of overall water splitting activity in 1 M KOH for various electrocatalyts.

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Reference
H-B/Ru-FeP	1.54	This Work
Ni-Fe-P/NF_{30}	1.58	[22]
Co-Mo-B-P/CF	1.59	[23]
Fe-Ni_2P/MoSx/NF	1.61	[24]
FCP@NG	1.63	[25]
δ-FeOOH NSs	1.62	[26]
$Ni_{0.7}Fe_{0.3}S_2$	1.63	[27]
NiFe-Se/C	1.68	[28]
Ni-Fe-P-350	1.67	[19]

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