Supporting Information

In-situ Phase-reconfiguration to Synthesize Ru, B Co-doped Nickel Phosphide for Energy-efficient Hydrogen Generation in Alkaline Electrolyte

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Physical Characterization

The crystal structure of the prepared samples was analyzed by x-ray diffraction (XRD), and the XRD of the samples was tested using a Rigaku Ultima IV at 40 kV and 40 mA through a rate of 5°/minute. and the morphology of the prepared samples was characterized by scanning electron microscopy (SEM JEOL, JSM-7500F) and transmission electron microscopy (TEM JEOL, JSM-7500F), and the elemental composition of the samples was studied by x-ray photoelectron spectroscopy (XPS AXIS SUPRA).

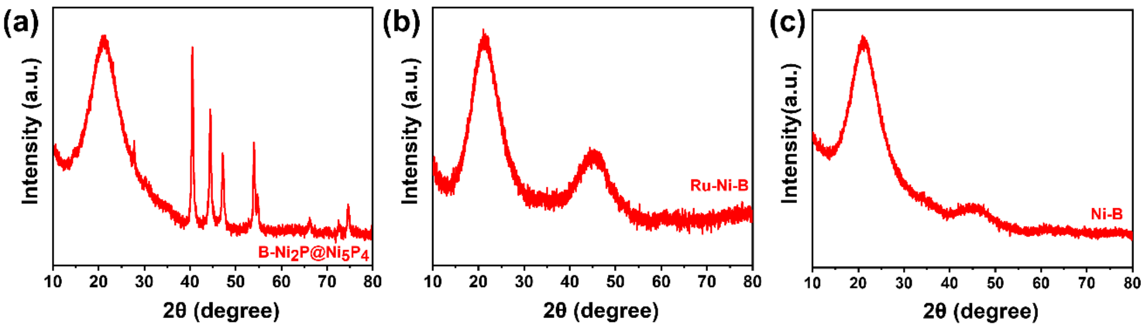

Figure S1. XRD patterns of B-Ni_2P/Ni_5P_4, Ru-Ni-B and Ni-B.

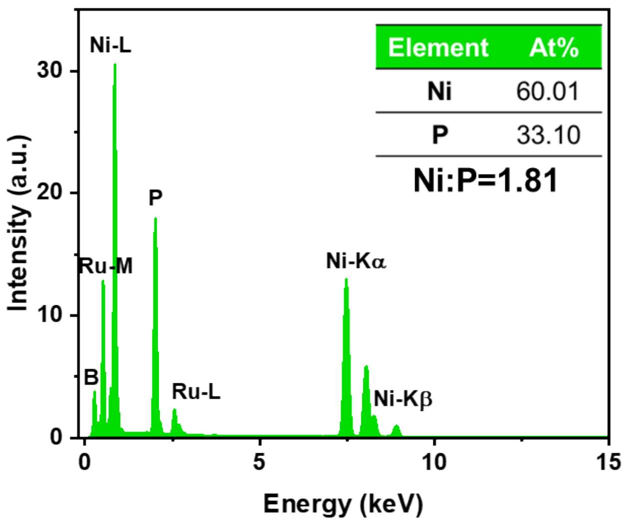

Figure S2. EDX spectrum of Ru/B-Ni_2P/Ni_5P_4.

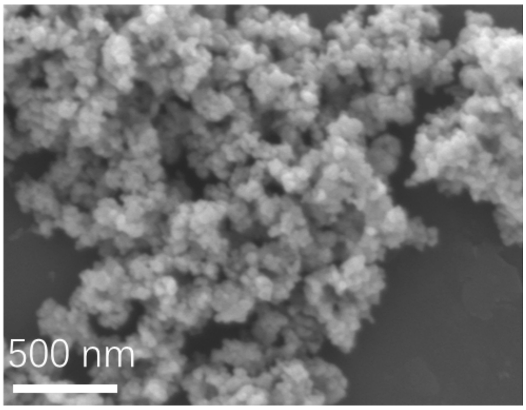

Figure S3. SEM images of Ru/B-Ni_2P/Ni_5P_4.

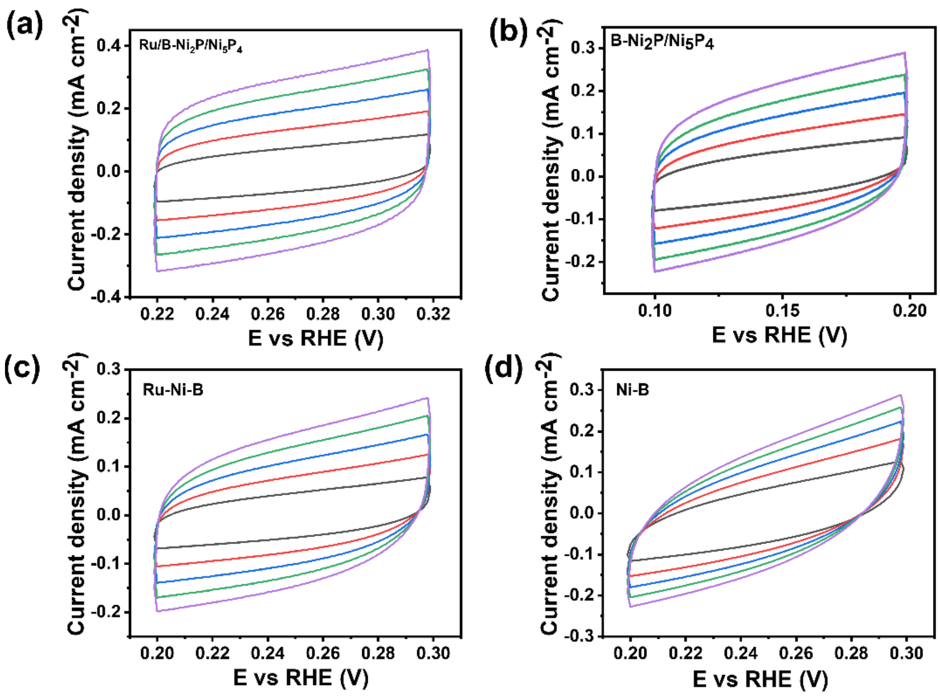

Figure S4. The CV curves of Ru/B-Ni_2P/Ni_5P_4, B-Ni_2P/Ni_5P_4, Ru-Ni-B, and Ni-B at 20 mV S^{-1}-100 mV S^{-1} sweep rate.

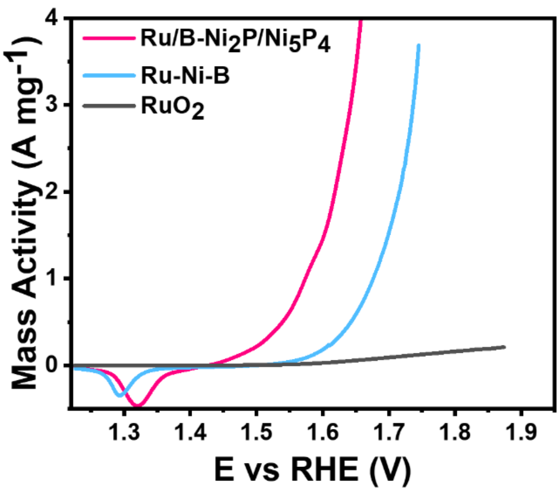

Figure S5. The mass activity curve of precious metal Ru.

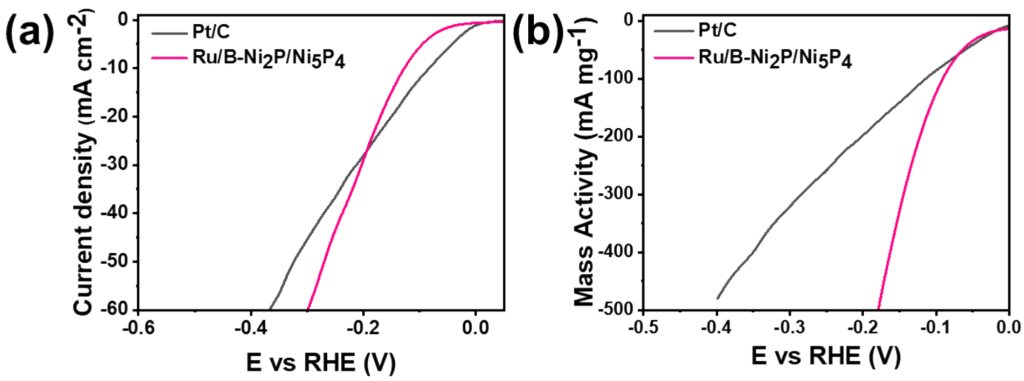

Figure S6. (a) The LSV curves of Ru/B-Ni_2P/Ni_5P_4. (b) The mass activity curve of Ru/B-Ni_2P/Ni_5P_4 and Pt/C

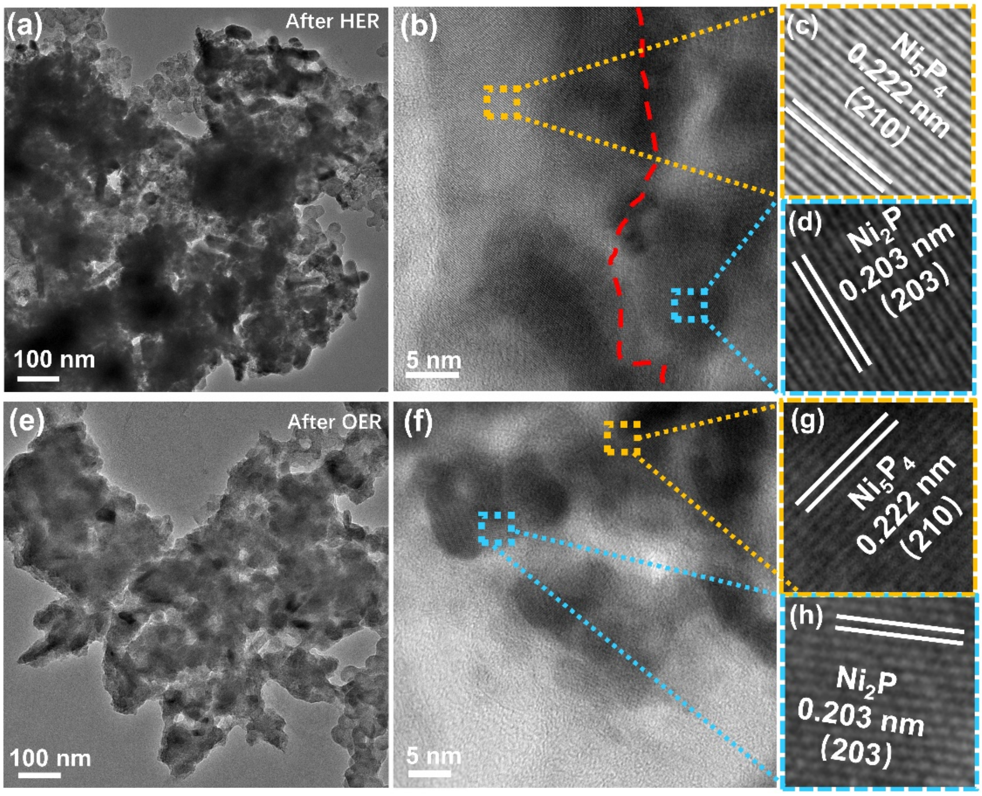

Figure S7. The TEM images of (a-d) and (e-h) for Ru/B-Ni_2P/Ni_5P_4 after HER and OER, respectively.

Table S1. Comparison of OER activity in 1M KOH for various electrocatalysts.

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Tafel slope	Reference
$NiSe_2$/NF	279 mV	97 mV dec-1	1
Ni_3N-NiMoN-5	277 mV	118 mV dec-1	2
Ni_2P nanosheets	320 mV	105 mV dec-1	3
(Ru-Co)O_x-350	265 mV	60 mV dec-1	4
Ni_2P-CoP	320 mV	69 mV dec-1	5
NiCoP/C	330 mV	96 mV dec-1	6
N-doped NiCoP_x/NCF	298 mV	60 mV dec-1	7

$NiCo_{2-x}Fe_xO_4$	274 mV	42 mV dec-1	8
$CoRu-MoS_2$	308 mV	50 mV dec-1	9
NiMoRuO	280 mV	100 mV dec-1	10
$1-RuO_2/CeO_2$	350 mV	74 mV dec-1	11
$Ni_{2-x}Ru_xP$	340 mV	NA	12
Ru-FeRu@C/NC	345 mV	64.7 mV dec-1	13
$Ru-MoS_2-Mo_2C$	280 mV	202 mV dec-1	14
This WorK	**270 mV**	**46.7 mV dec^{-1}**	

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

Electrocatalysts	Overpotential at 10 mA cm^{-2}	Tafel slope	Reference
Ni_2P-CoP HNSA/CC	40 mV	120 mV dec^{-1}	15
$Mn-Ni_2P/NF$	103 mV@20mAcm^{-2}	135 mV dec^{-1}	16
Ni_2P NPs/CC	73 mV	73 mV dec^{-1}	17
$Ni_2P-Ni_5P_4$	102 mV	83 mV dec^{-1}	18
H-FeNiP	87 mV	88 mV dec^{-1}	19
Ni_5P_4-Ru	54 mV	52 mV dec^{-1}	20
Te/FeNiOOH-NCs	167 mV	93 mV dec^{-1}	21
$Ru/C-Ti_3C_2T_x/NF$	37 mV	60 mV dec^{-1}	22
NiSe@NiFe-LDH/NF	68 mV	106 mV dec^{-1}	23
Ru-NiFe-P	44 mV	80 mV dec^{-1}	24
Ru-MnFeP/NF	35 mV	36 mV dec^{-1}	25

Ru-NiCoP/NF	44 mV	45.4 mV dec^{-1}	26
$Ru_{0.10}$@2H-MoS_2	51 mV	64.9 mV dec^{-1}	27
Ru-FeRu@C/NC	23 mV	23.7 mV dec^{-1}	28
Ru-Co_2P/N-C/NF	65 mV	65 mV dec^{-1}	29
Ru/C-$Ti_3C_2T_x$/NF	37 mV	60 mV dec^{-1}	30
Ru-MoS_2-Mo_2C	25 mV	58 mV dec^{-1}	31
Vs-Ru-Ni_9S_8	56 mV	46.8 mV dec^{-1}	32
This WorK	**34 mV**	**57.5 mV dec^{-1}**	

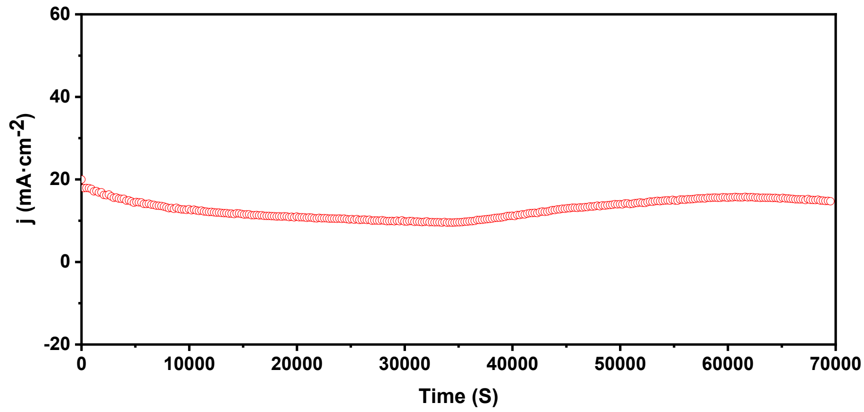

Figure S8. the i-t curves of the assembled electrodes in the UOR || HER system.

Figure S9. The photo of the location where the seawater was obtained.

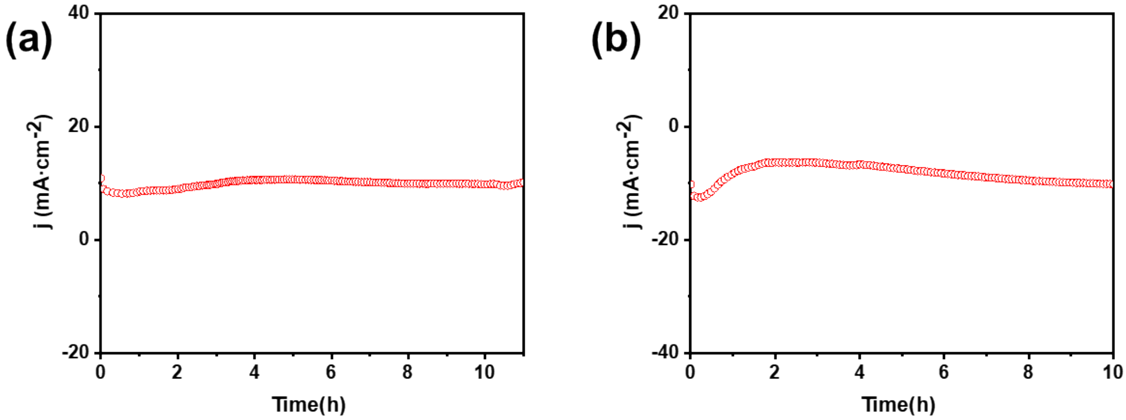

Figure S10. the i-t curves of the assembled electrodes in the 1 M KOH + seawater. (a) OER, (b) HER.

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