Supporting Information for

(B,P,Co,Fe)-Ni Modified on Nanowood for Boosting Seawater Urea Electro-Oxidation

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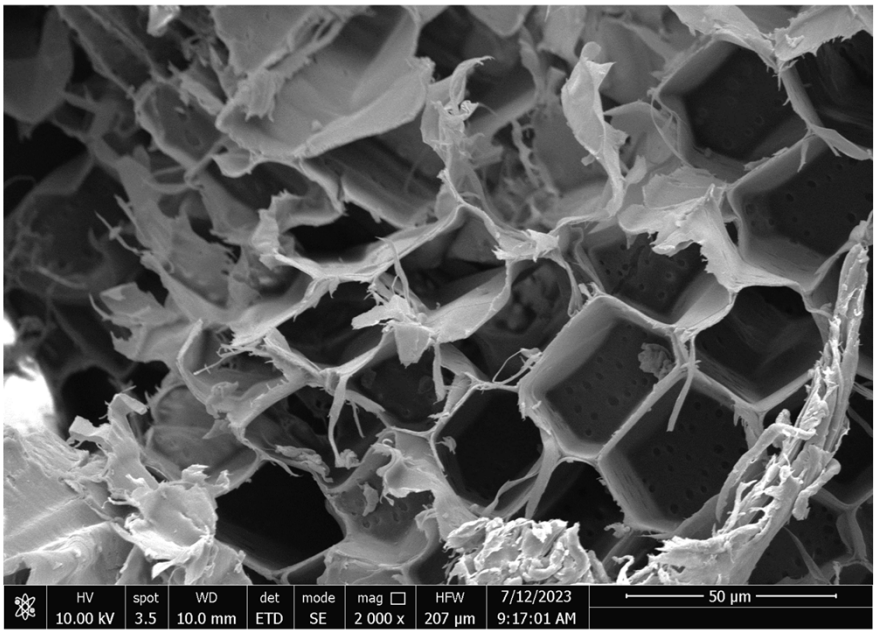


Fig. S1 SEM image of the natural paulownia wood.

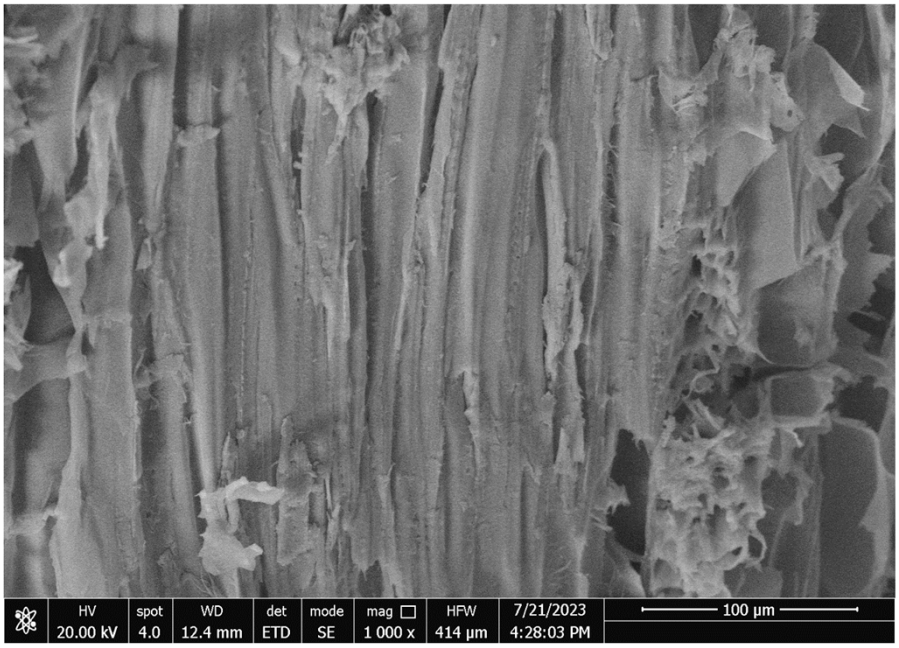


Fig. S2 SEM images of the natural paulownia wood along the direction of tree growth.

Fig. S3 The photo of the natural leave loaded with alloys.

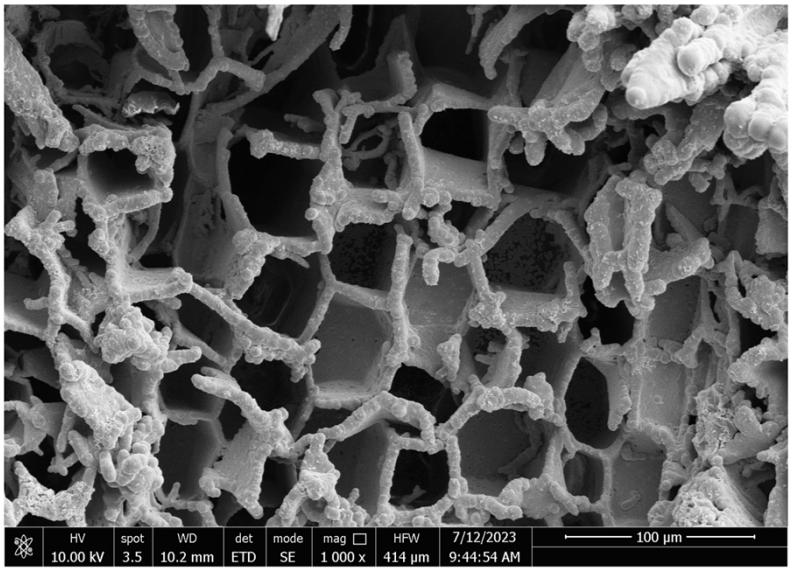


Fig. S4 SEM images of the (B,P,Co,Fe)-Ni@PW.

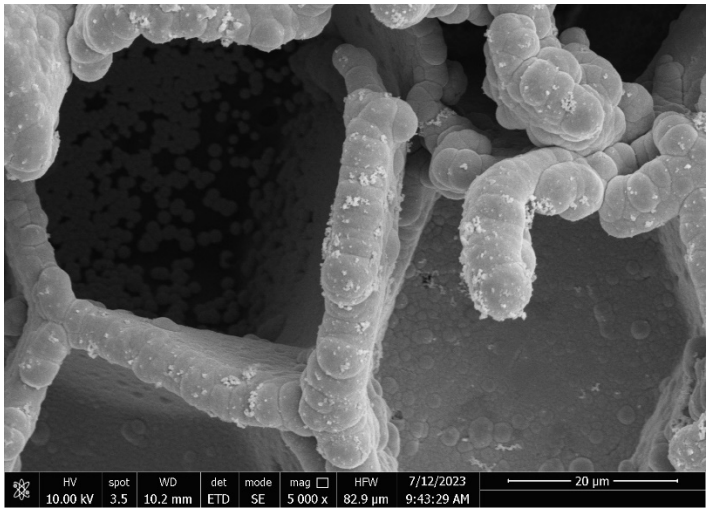


Fig. S5 SEM images of the (B,P,Co,Fe)-Ni@PW.

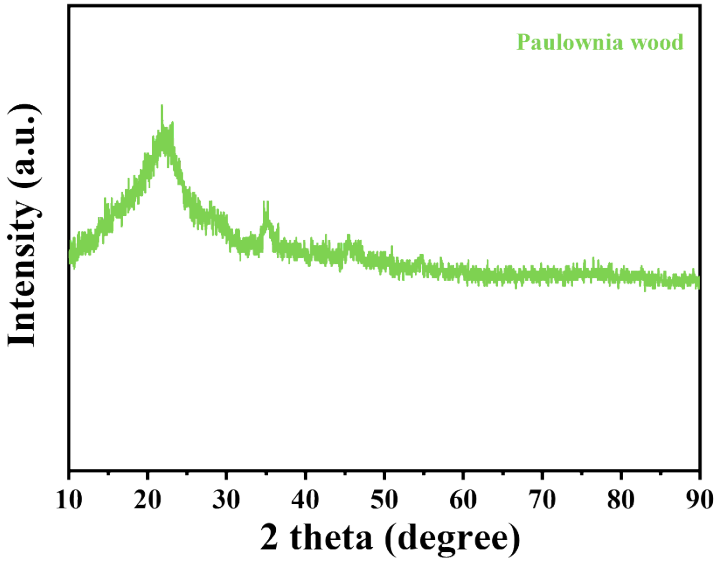


Fig. S6 XRD pattern of PW.

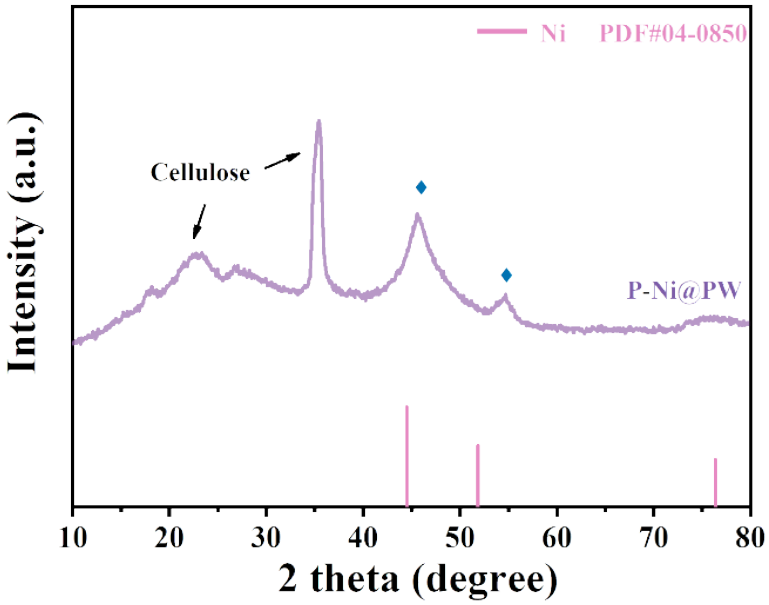


Fig. S7 XRD pattern of P-Ni@PW.

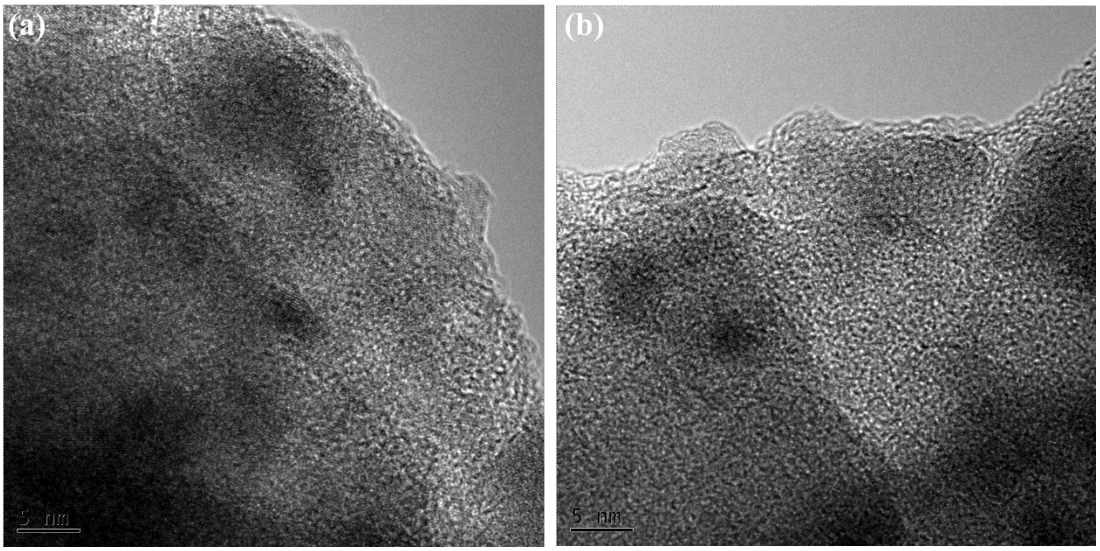


Fig. S8 HRTEM images of the (B,P,Co,Fe)-Ni@PW.

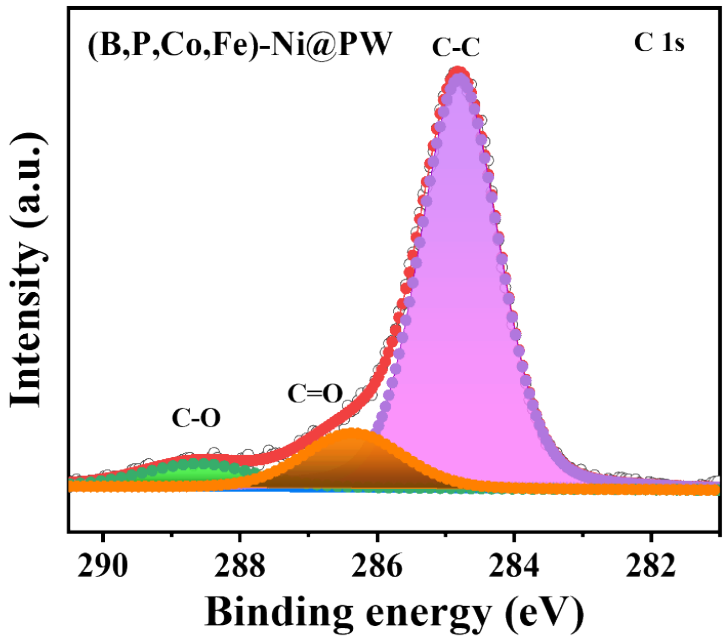


Fig. S9 High-resolution XPS spectra of (B,P,Co,Fe)-Ni@PW for C 1s.

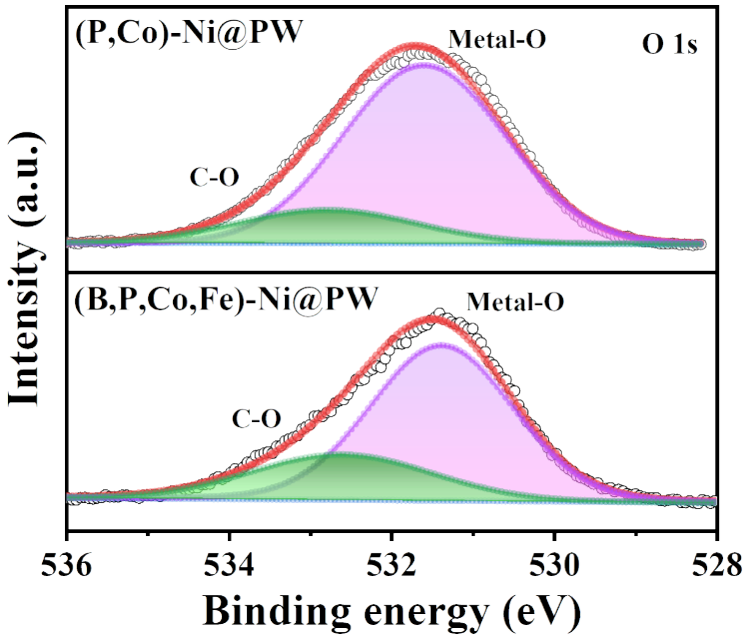


Fig. S10 High-resolution XPS spectra of (P,Co)-Ni@PW and (B,P,Co,Fe)-Ni@PW for O 1s.

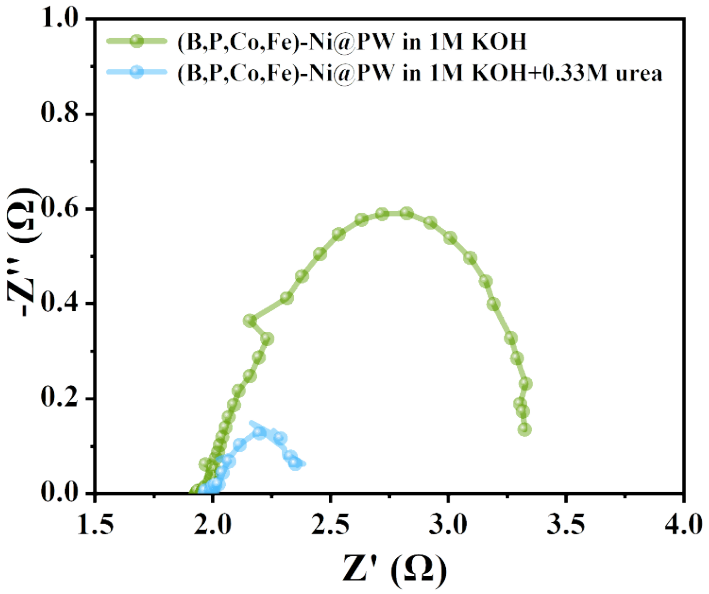


Fig. S11 Nyquist plots of the (B,P,Co,Fe)-Ni@PW for OER and UOR.

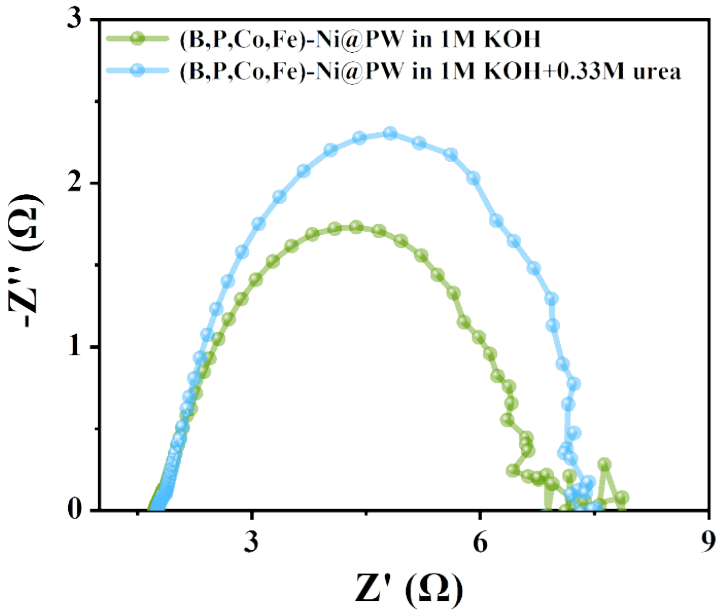


Fig. S12 Nyquist plots of the (B,P,Co,Fe)-Ni@PW for HER in 1 M KOH with and without urea.

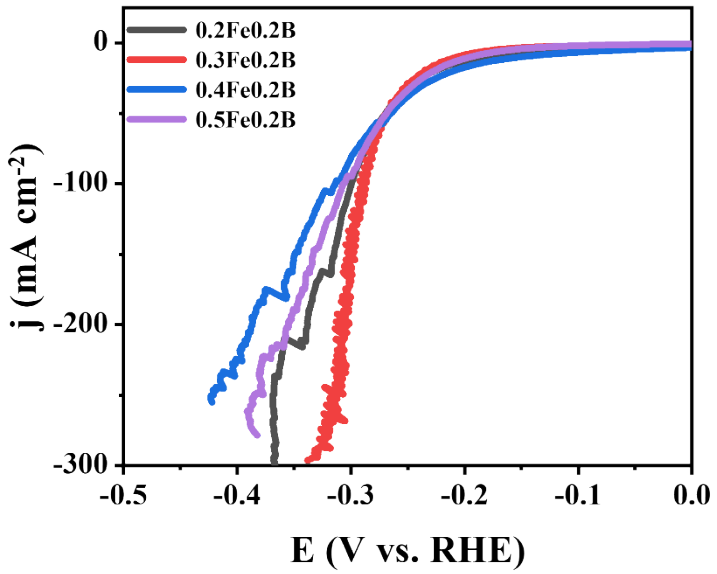


Fig. S13 HER polarization curves of (B,P,Co,Fe)-Ni@PW with different mass ratios.

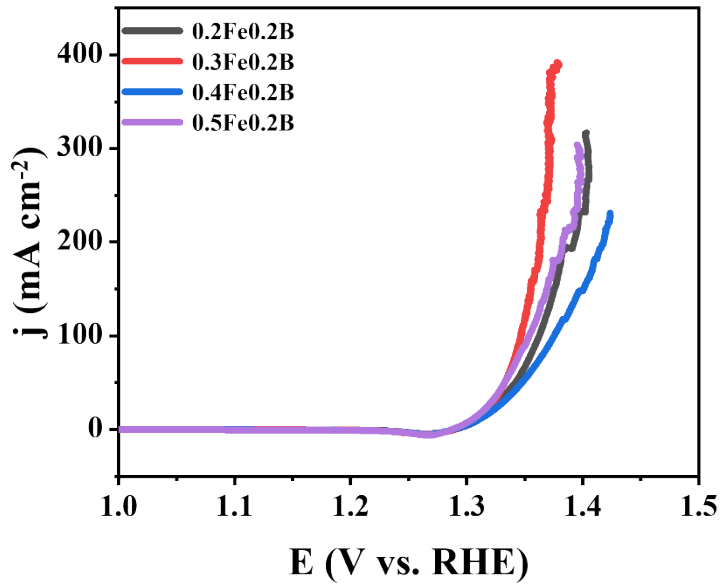


Fig. S14 UOR polarization curves of (B,P,Co,Fe)-Ni@PW with different mass ratios.

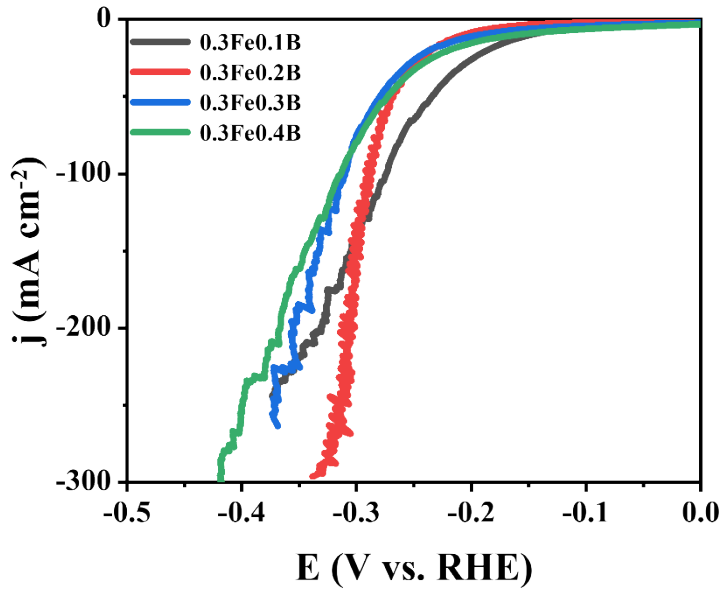
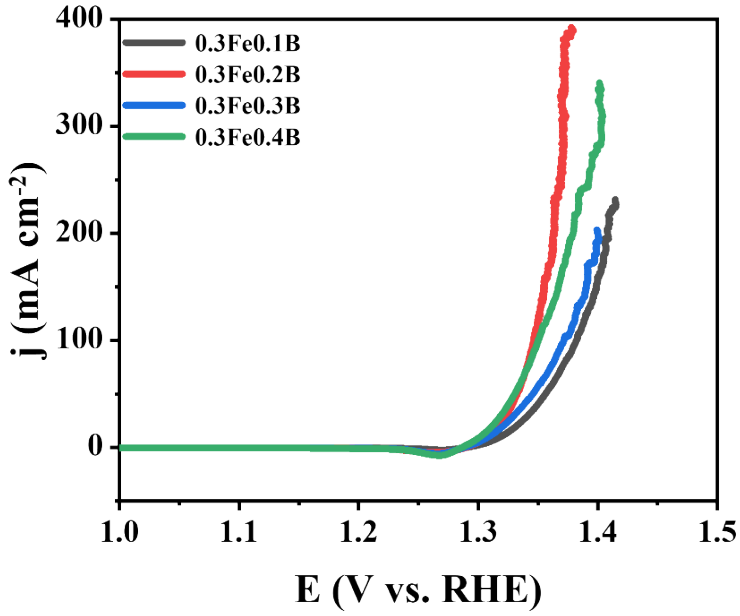


Fig. S15 HER polarization curves of (B,P,Co,Fe)-Ni@PW with different mass ratios.



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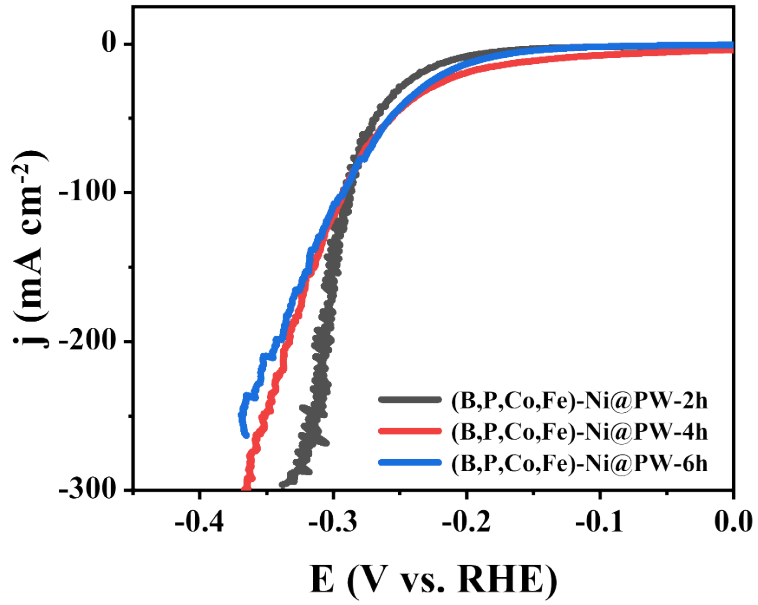
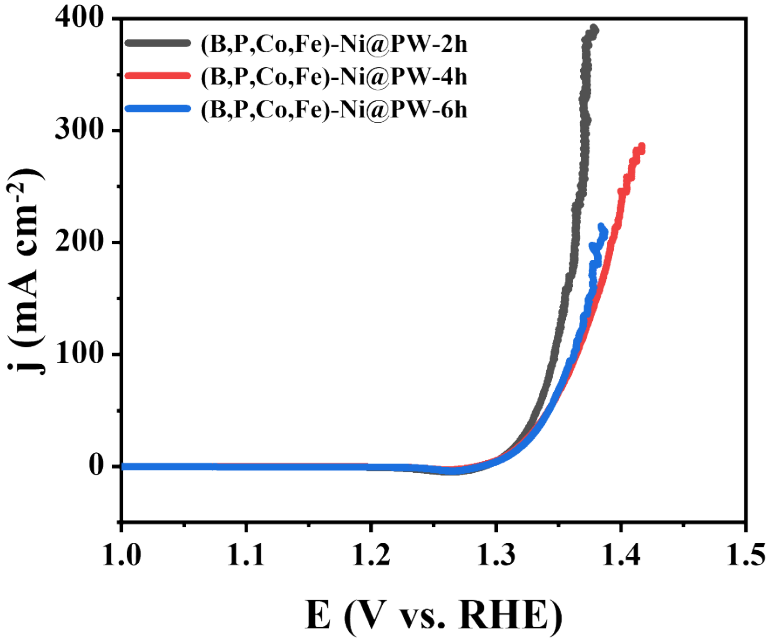


Fig. S17 HER polarization curves of (B,P,Co,Fe)-Ni@PW at different reaction times.



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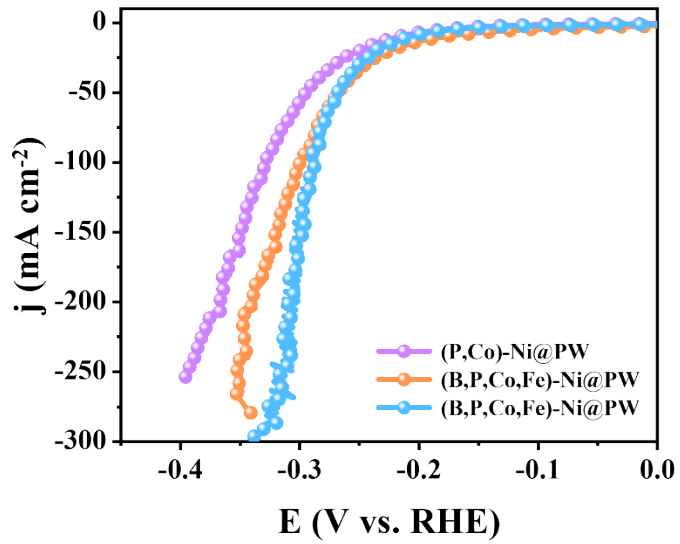

Fig. S19 HER polarization curves of (P,Co)-Ni@PW, (B,P,Fe)-Ni@PW, and (B,P,Co,Fe)-Ni@PW.

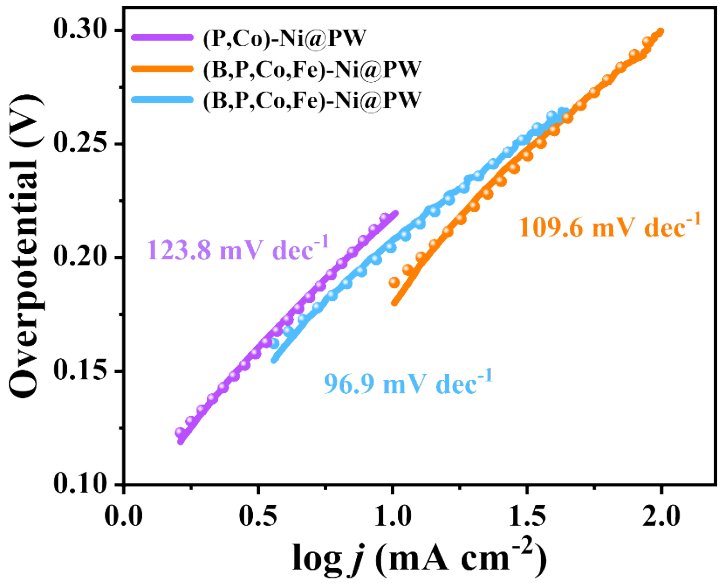

Fig. S20 The Tafel slopes of (P,Co)-Ni@PW, (B,P,Fe)-Ni@PW, and (B,P,Co,Fe)-Ni@PW for HER.

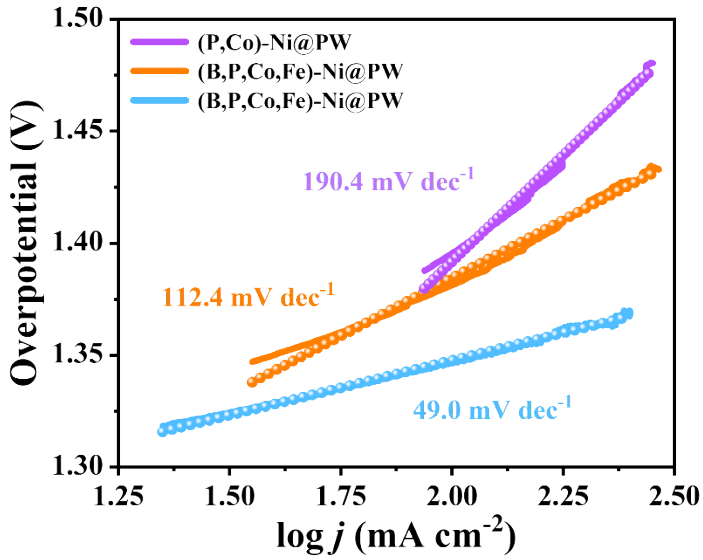

Fig. S21 The Tafel slopes of (P,Co)-Ni@PW, (B,P,Fe)-Ni@PW, and (B,P,Co,Fe)-Ni@PW for UOR.

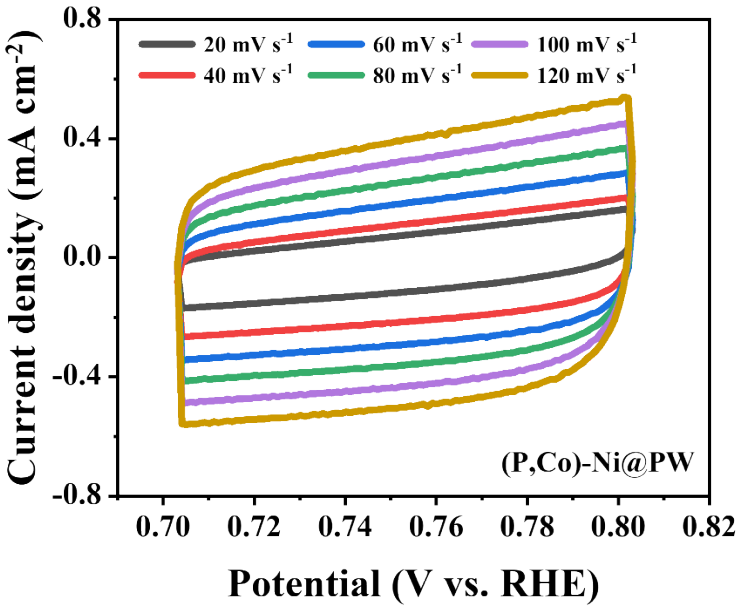

Fig. S22 CV curves of the (P,Co)-Ni@PW at different scan rates.

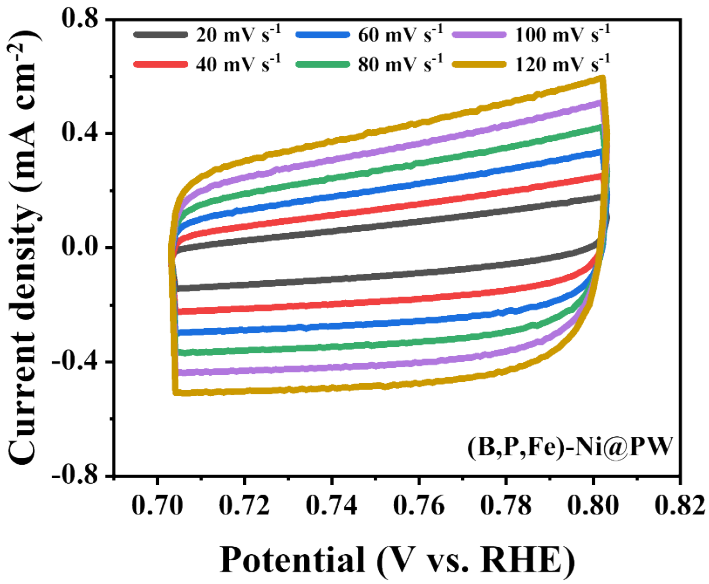

Fig. S23 CV curves of the (B,P,Fe)-Ni@PW at different scan rates.

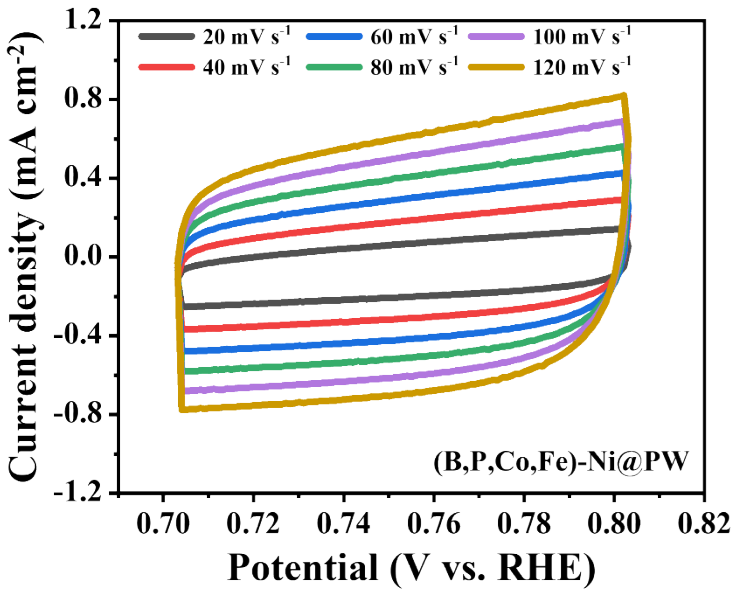

Fig. S24 CV curves of the (B,P,Co,Fe)-Ni@PW at different scan rates.

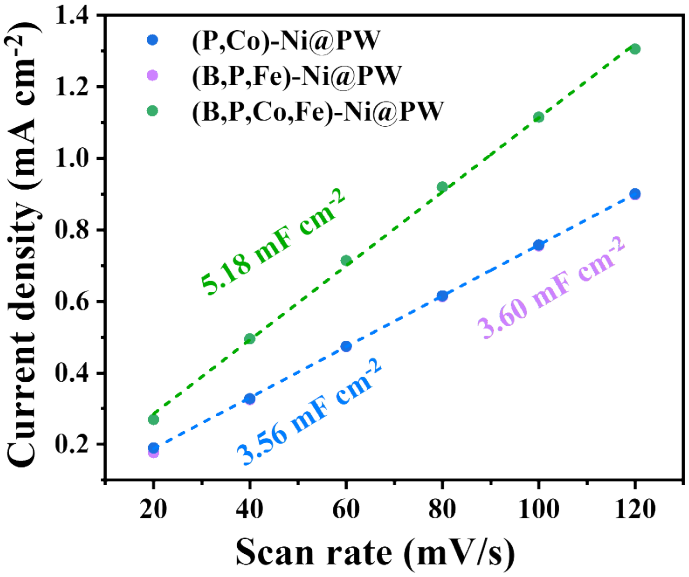

Fig. S25 Evaluated C_{dl} values of (P,Co)-Ni@PW, (B,P,Fe)-Ni@PW, and (B,P,Co,Fe)-Ni@PW.

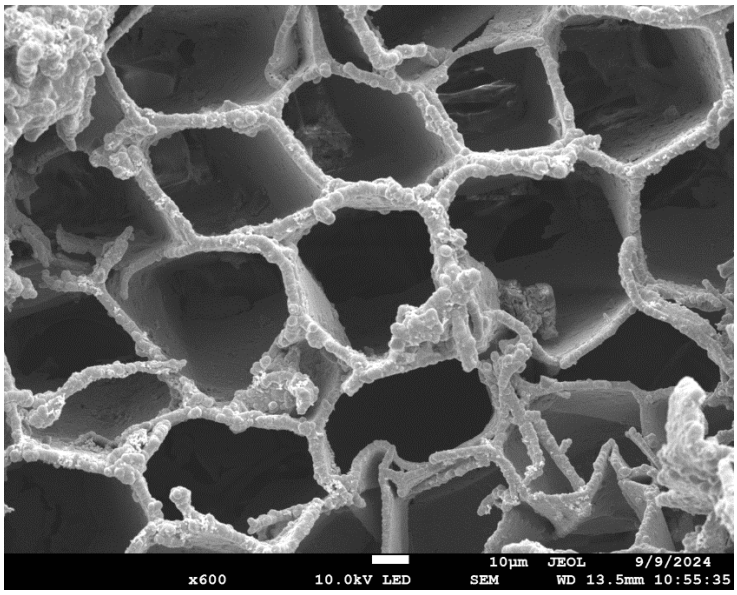

Fig. S26 SEM image of the (B,P,Co,Fe)-Ni@PW after cycle test for HER.

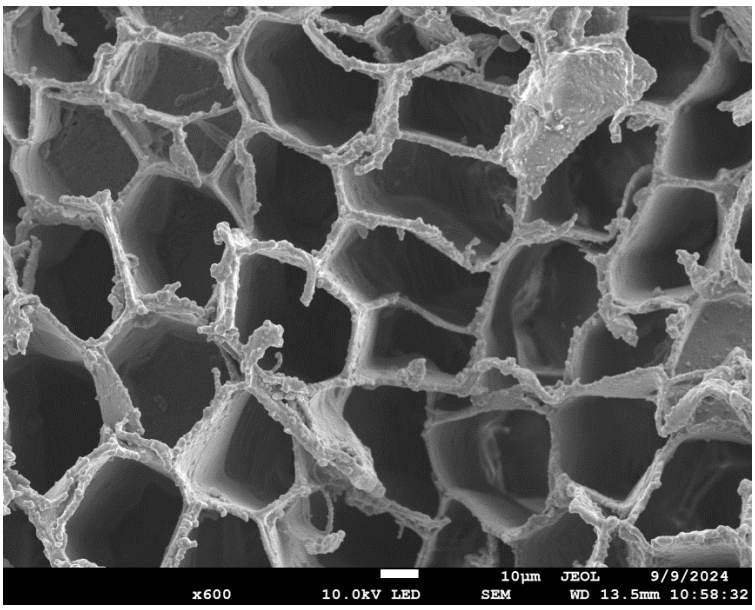

Fig. S27 SEM image of the (B,P,Co,Fe)-Ni@PW after cycle test for UOR.

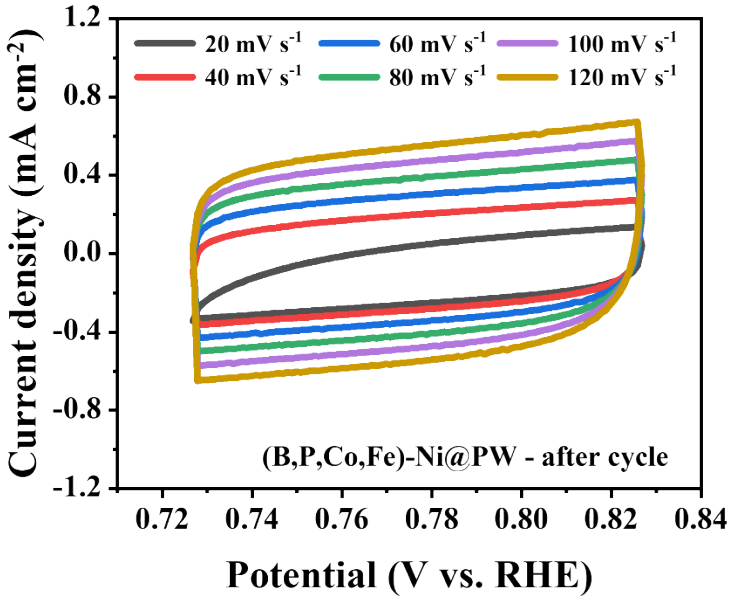

Fig. S28 CV curves of the (B,P,Co,Fe)-Ni@PW after cycle.

Fig. S29 The photo shows the initial state of the balloon in 1 M KOH + 0.33 M urea.

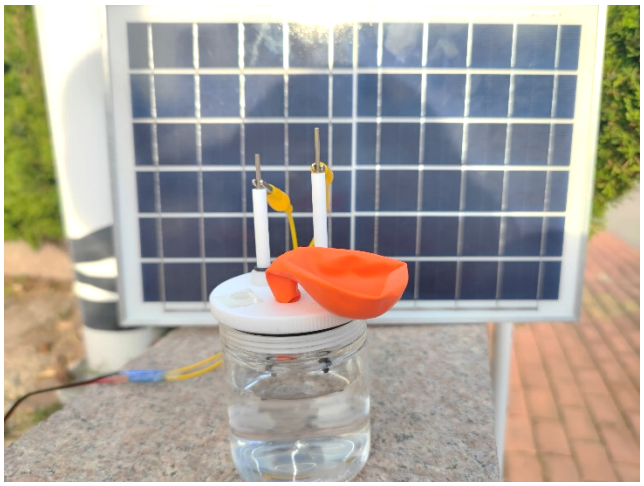

Fig. S30 The photo shows the initial state of the balloon in 1 M KOH.

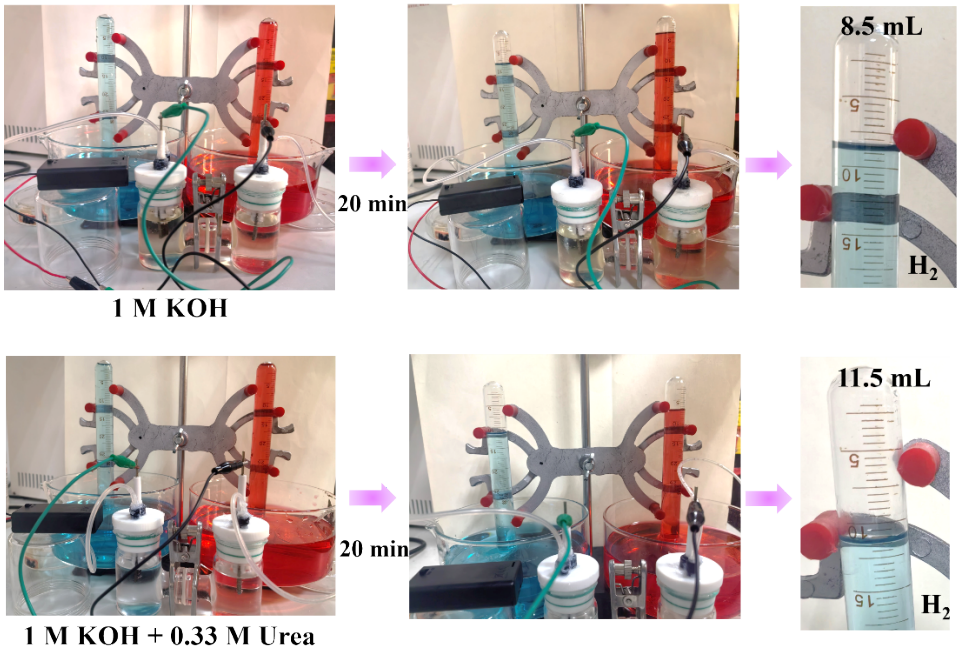

Fig. S31 The photos showing the HER||OER and HER||UOR electrolyzer.

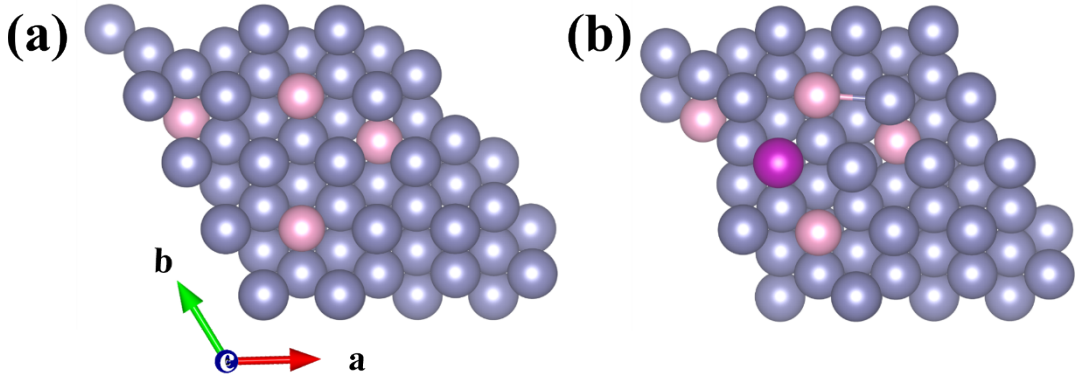

Fig. S32 DFT-optimized structure model of the a) P-Ni@PW, b) (P,Co)-Ni@PW.

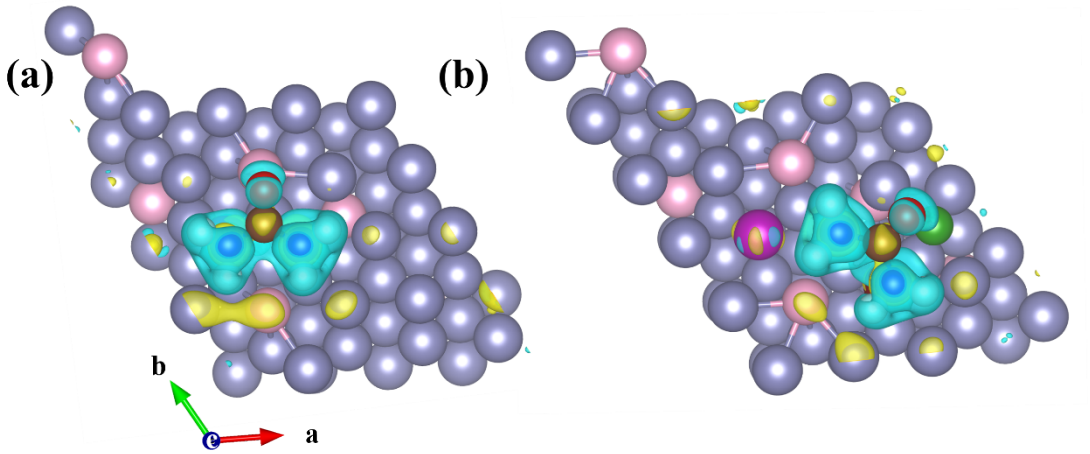

Fig. S33 Charge density difference for a) P-Ni@PW, b) (P,Co)-Ni@PW.

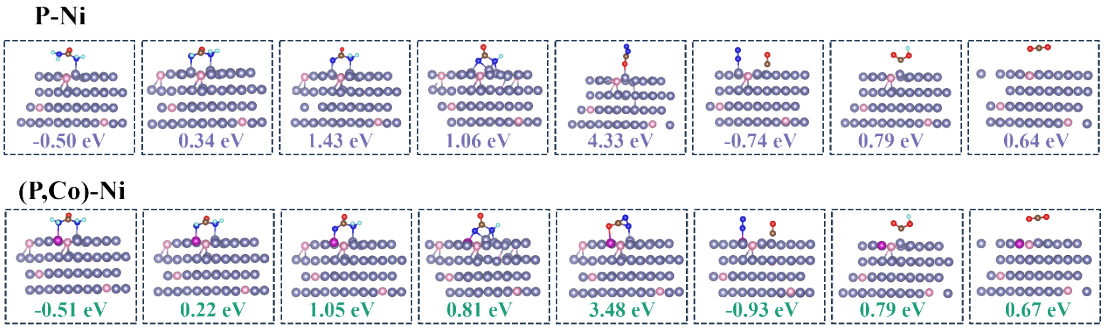

Fig. S34 Schematic illustration of the proposed UOR mechanisms.

Table S1. UOR performance comparison between (B,P,Co,Fe)-Ni@PW and recently reported UOR electrocatalysts in alkaline urea media.

Electrocatalysts	Electrolyte	η_{100} V	Refs
(B,P,Co,Fe)-Ni@PW	1 M KOH+0.33 M Urea	**1.34**	**This work**
Ni/W_5N_4	1 M KOH+0.5 M Urea	1.38	[S1]
hcp-CoNi-N/C	1 M KOH+0.33 M Urea	1.39	[S2]
Ni_3/Mo_2N	1 M KOH+0.33 M Urea	1.37	[S3]
NiCoGe	1 M KOH+0.33 M Urea	1.33	[S4]
O_{vac}-NiOOH	1 M KOH+0.33 M Urea	1.47	[S5]
Fe-Ni_3S_2	1 M KOH+0.33 M Urea	1.50	[S6]
NiOOH/LDH/FeOOH	1 M KOH+0.33 M Urea	1.39	[S7]
$Ni(OH)_2$/NF	1 M KOH+0.33 M Urea	1.45	[S8]
Ni-CuO/NF	1 M KOH+0.33 M Urea	1.36	[S9]
Ni-TPA@ NiSe/NF	1 M KOH+0.33 M Urea	1.37	[S10]

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