Hollow Bimetallic Selenide Derived from Hierarchical MOF-based Prussian Blue Analogue for Urea Electrolysis

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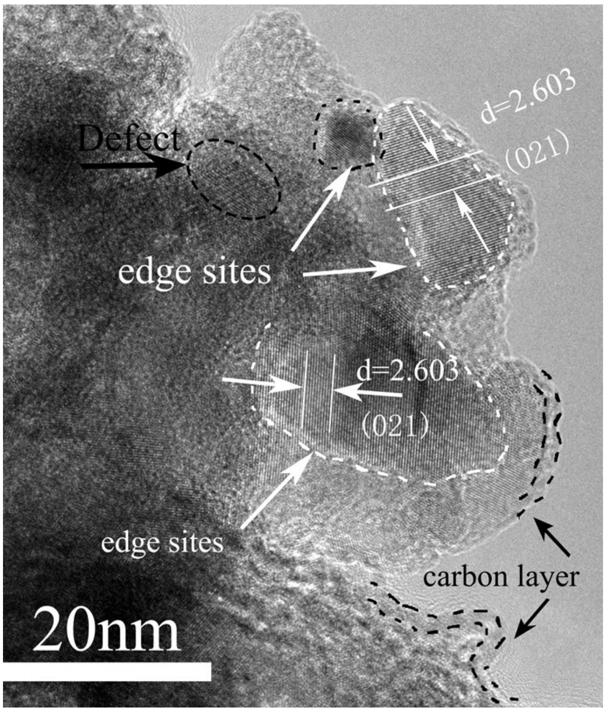

Figure S1. HRTEM image of PBA@MOF-Ni/Se.

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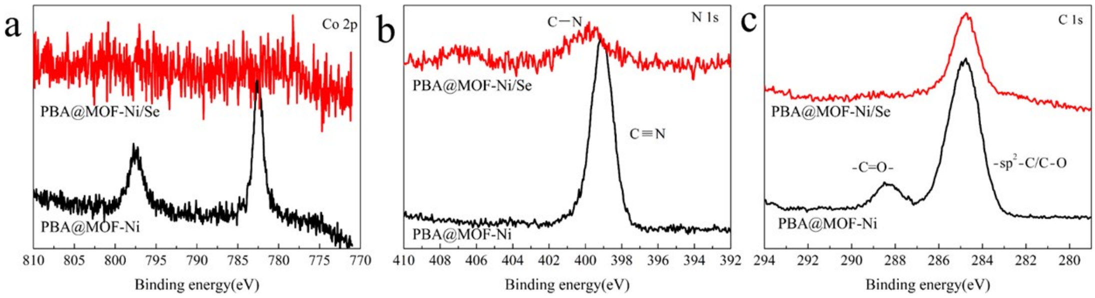

Figure S2. XPS spectra of (a) Co 2p; (b) N 1s; (c) C 1s of PBA@MOF-Ni and PBA@MOF-Ni/Se.

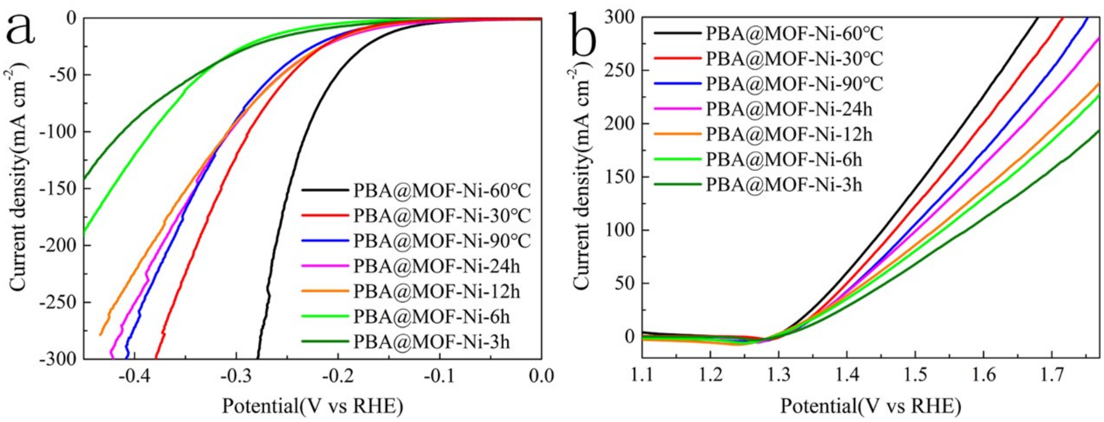

Figure S3. (a) Polarization curves of PBA@MOF-Ni/Se under different reaction conditions towards HER in 1.0 M KOH with 0.5 M urea; (b) Polarization curves of PBA@MOF-Ni/Se under different reaction conditions towards UOR in 1.0 M KOH with 0.5 M urea.

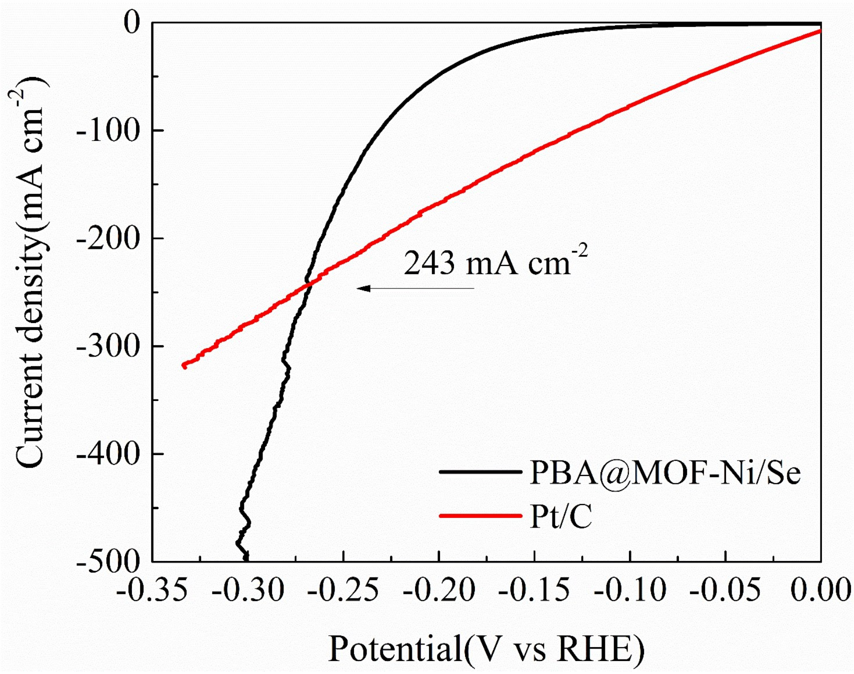

Figure S4. LSV curves towards HER of PBA@MOF-Ni/Se and commercial Pt/C.

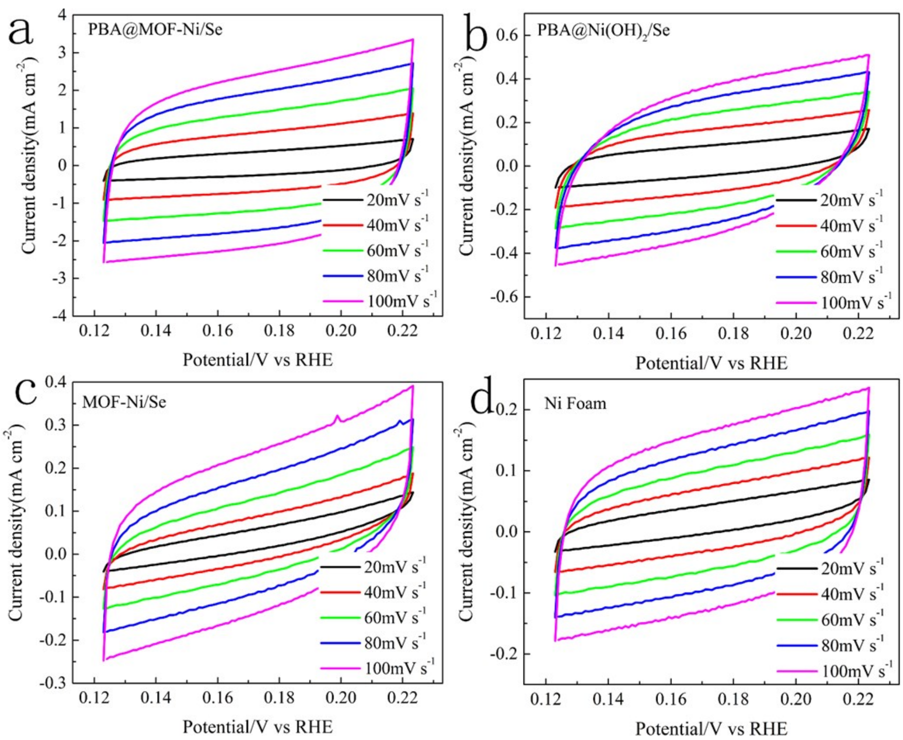

Figure S5. CV curves of (a) PBA@MOF-Ni/Se; (b) PBA@Ni(OH)$_2$/Se; (c) MOF-Ni/Se; (d) Ni foam; (e) ECSA evaluation towards HER in 1.0 M KOH with 0.5 M urea.

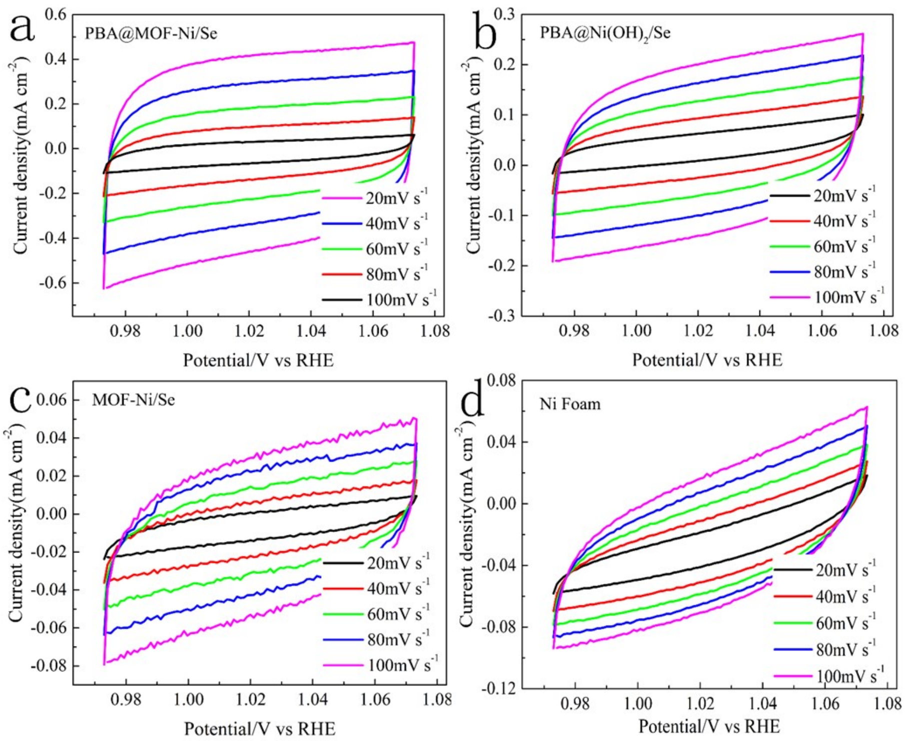

Figure S6. CV curves of (a) PBA@MOF-Ni/Se; (b) PBA@$Ni(OH)_2$/Se; (c) MOF-Ni/Se; (d) Ni foam; (e) ECSA evaluation towards UOR in 1.0 M KOH with 0.5 M urea.

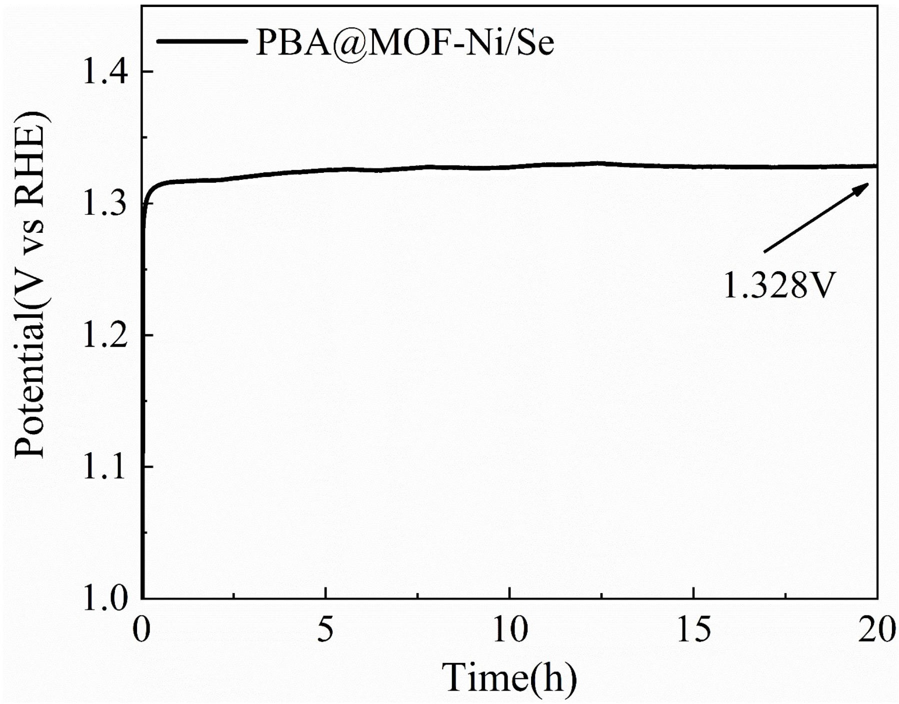

Figure S7. Chronopotentiometry curve of PBA@MOF-Ni/Se towards UOR at 10 mA cm^{-2} for 20h.

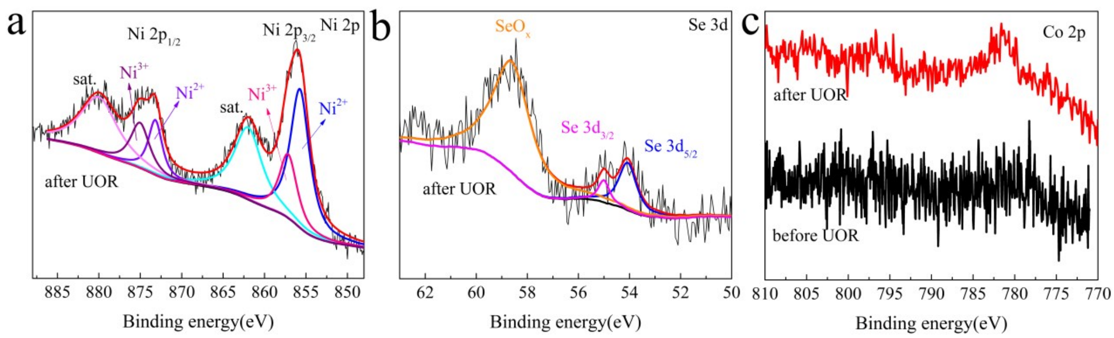

Figure S8. XPS spectra of (a) Ni 2p (b) Se 3d and (c) Co 2p of PBA@MOF-Ni/Se before and after UOR.

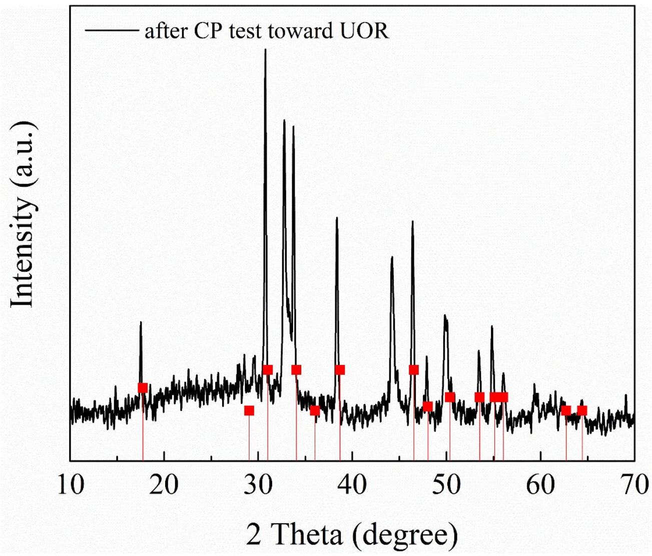

Figure S9. XRD pattern of PBA@MOF-Ni/Se after CP test towards UOR.

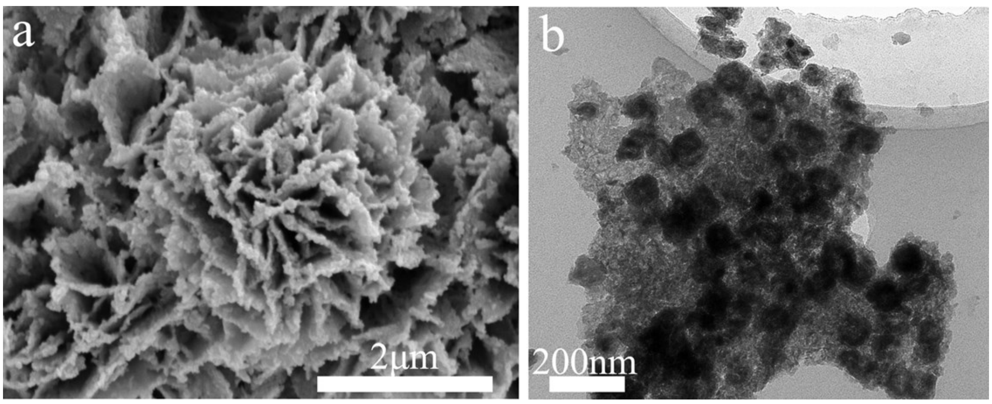

Figure S10. (a) SEM image of PBA@MOF-Ni/Se after CP test towards UOR; (b) TEM image of PBA@MOF-Ni/Se after CP test towards UOR.

Table S1. Comparison of the electrocatalytic activity of PBA@MOF-Ni/Se towards UOR in alkaline media with catalysts reported previously.

Electrocatalysts	Electrolyte	Potential (V vs. RHE) at 10 mA cm^{-2}	Ref
PBA@MOF-Ni/Se	1.0 M KOH 0.5 M Urea	1.319 V	This work
CoS_2	1.0 M KOH 0.3 M Urea	1.4 V	1
Ni_2P/Fe_2P	1.0 M KOH 0.5 M Urea	1.36 V	2
Ni/NiO	1.0 M KOH 0.33 M Urea	1.33 V	3
$MnO_2/MnCo_2O_4$	1.0 M KOH 0.5 M Urea	1.33 V	4
$NiMoO_4·H_2O$	1.0 M KOH 0.5 M Urea	1.35 V	5
Ni MOF	1.0 M KOH 1.0 M Urea	1.36 V	6

HC-NiMoS/Ti	1.0 M KOH 0.5 M Urea	1.38 V	7
NF-G-Mn	1.0 M KOH 0.5 M Urea	1.33 V	8
CoN NF/NF	1.0 M KOH 0.5 M Urea	1.342 V	9
$Ni_{(10\%)}Pd_{(10\%)}$/OMC	1.0 M KOH 0.33 M Urea	1.346 V	10

Table S2. Comparison of the electrocatalytic performance of PBA@MOF-Ni/Se || PBA@MOF-Ni/Se towards overall urea electrolysis in alkaline media with catalysts reported previously.

Catalyst	Electrolyte	Cell voltage at 10 mA cm^{-2}	Ref
PBA@MOF-Ni/Se	1.0 M KOH 0.5 M Urea	1.495 V	This work
CoS_2	1.0 M KOH 0.3 M Urea	1.59 V	1
$MnO_2/MnCo_2O_4$	1.0 M KOH 0.5 M Urea	1.55 V	4
HC-NiMoS/Ti	1.0 M KOH 0.5 M Urea	1.59 V	7
NF-Pt/C	1.0 M KOH 0.5 M Urea	1.63 V	11
NF-Pt/C|| NF-IrO_2	1.0 M KOH 0.5 M Urea	1.72 V	11
NiMoS	1.0 M KOH 0.5 M Urea	1.59 V	12

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