

Hierarchical Co₃O₄@Ni₃S₂ electrode materials for energy storage and conversion

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Fig S1 CV curves at different scan rates (a) Co_3O_4 (b) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2-1$ (c) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2-5$ GCD curves at different current densities (d) Co_3O_4 (e) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2-1$ (f) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2-5$

Table S1 The electrochemical properties of electrode materials

Material	Electrolyte	Specific capacity	Current density	Capacity retention	Ref.
Co ₃ O ₄ @Co-MOF	3 M KOH	1020 F g ⁻¹	0.5 A g ⁻¹	96.7 % (5000 cycles)	41
Ni ₃ Si ₂ /NiOOH/graphen e	3 M KOH	835.3 C g ⁻¹	1 A g ⁻¹	90.7 % (6000 cycles)	42
Ni ₃ S ₂ /Ni ₃ N/Ni@NVCN	2 M KOH	856.3 C g ⁻¹	3 A g ⁻¹	83.0 % (4000 cycles)	43
C/NiCo ₂ S ₄	6 M KOH	1545 F g ⁻¹	2 A g ⁻¹	90.1 % (6000 cycles)	44
NiCo ₂ S ₄	3 M KOH	1298 F g ⁻¹	1 A g ⁻¹	90.4 % (8000 cycles)	45
Co ₃ O ₄ @Ni ₃ S ₂	3 M KOH	1077 C g ⁻¹	1 A g ⁻¹	86.7 % (10000 cycles)	This work

Table S2 The electrochemical performance data of as-prepared samples

Capacity (C g ⁻¹) Samples	Current density (A g ⁻¹)					Rate performance (%)
	1	2	4	6	10	
Co ₃ O ₄	410	396	373	357	327	79.8
Co ₃ O ₄ @Ni ₃ S ₂ -1	863	834	797	768	689	79.8
Co ₃ O ₄ @Ni ₃ S ₂ -3	1071	1030	985	945	865	80.3
Co ₃ O ₄ @Ni ₃ S ₂ -5	734	677	598	543	449	61.2

Fig. S2 Fitting results of Nyquist plots (a) Co_3O_4 sample (b) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2$ -1 sample (c) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2$ -3 sample (d) $\text{Co}_3\text{O}_4@\text{Ni}_3\text{S}_2$ -5 sample

Fig. S3 (a) XRD before and after cycle (b) SEM after cycle

Table S3 OER properties of electrode materials

Electrode materials	Overpotential	Tafel	References
Ni ₃ S ₂ /MnO ₂	260 mV (10 mA cm ⁻²)	61 mV dec ⁻¹	55
Ni ₃ S ₂ /Ni	310 mV (10 mA cm ⁻²)	80.1 mV dec ⁻¹	56
Co ₃ O ₄ /Fe ₂ O ₃	310 mV (10 mA cm ⁻²)	67 mV dec ⁻¹	57
NiO/CN	287 mV (10 mA cm ⁻²)	58.92 mV dec ⁻¹	58
(Fe-Ni)Co _x -OH/Ni ₃ S ₂	280 mV (10 mA cm ⁻²)	75 mV dec ⁻¹	59
Co ₃ O ₄ @Ni ₃ S ₂	237.6 mV (10 mA cm ⁻²)	56.78 mV dec ⁻¹	This work