Supporting Information

MoS_2/Ni_xS_y/NF Heterojunction Catalyst for Efficient Oxygen Evolution Reaction

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1. Experimental Section

1.1 Materials and chemicals

Na_2MoO_4 (A.R., 99.0%) and CH_3CSNH_2 (A.R., 99.0%) were purchased from Titan. Nickel Foam (NF) purchased from Suzhou Kesheng and Metal Materials All reagents can be used without further purification.

1.2 Synthesis of MoS_2/Ni_xS_y/NF

Nickel foam of 2×4 cm^2 size was sonicated in a 3M HCl solution for 15 min, and then the treated nickel foam was washed several times with deionized water and ethanol and dried. Dissolve 2.4 mmol of Na_2MoO_4 and different amounts (3.2–8 mmol) of CH_3CSNH_2in 35 mL of deionized water with continuous magnetic stirring for 15 min, and after obtaining a clear and transparent solution, transfer the solution to a 50 ml PTFE reactor and put the treated nickel foam into it at an angle. After sealing the reaction system, the reactor was put into an electrically heated, constant-temperature blast drying oven and reacted at 200 °C for 12 h.After the reaction is complete, the product is washed multiple times with deionized water and ethanol, and dried in a vacuum drying oven at 60 ℃ to obtain MoS_2/Ni_xS_y/NF.

1.3 Synthesis of MoS_2/NF

Dissolve 2.4 mmol of Na_2MoO_4 and 6.4 mmol of CH_3CSNH_2in 35 mL of deionized water and stir continuously for 15 minutes to obtain a clear and transparent solution. Transfer the solution to a 50 ml polytetrafluoroethylene reaction vessel and seal the reaction system. Place the reaction vessel in an electric constant temperature blast drying oven at 200 ℃ for 12 hours. After the reaction is complete, the product is washed multiple times with deionized water and ethanol, and dried in a 60 ℃ vacuum drying oven to obtain MoS_2 powder. 5 mg MoS_2 powder was dispersed in a mixture of 485 ul ethanol, 485 ul deionized water and 30 ul Nafion solution for ultrasonic 30 min, then 480 ul solution was smeared on 1×1.2 cm^2 foam nickel and dried to obtain MoS_2/NF.

1.4 Synthesis of Ni_3S_2/NF

Nickel foam of 2×4 cm^2 size was sonicated in a 3M HCl solution for 15 min, and then the treated nickel foam was washed several times with deionized water and ethanol and dried. Dissolve 6.4 mmol of CH_3CSNH_2 in 35 mL of deionized water and continue magnetic stirring for 15 min to obtain a clear and transparent solution, then transfer the solution to a 50 ml polytetrafluoroethylene reactor, and tilt the treated foam nickel into it. After sealing the reaction system, place the reaction kettle in an electric constant temperature blast drying oven at 200 ℃ for 12 hours of reaction. After the reaction is complete, the product is washed multiple times with deionized water and ethanol, and dried in a vacuum drying oven at 60 ℃ to obtain Ni_3S_2/NF.

2. Figures

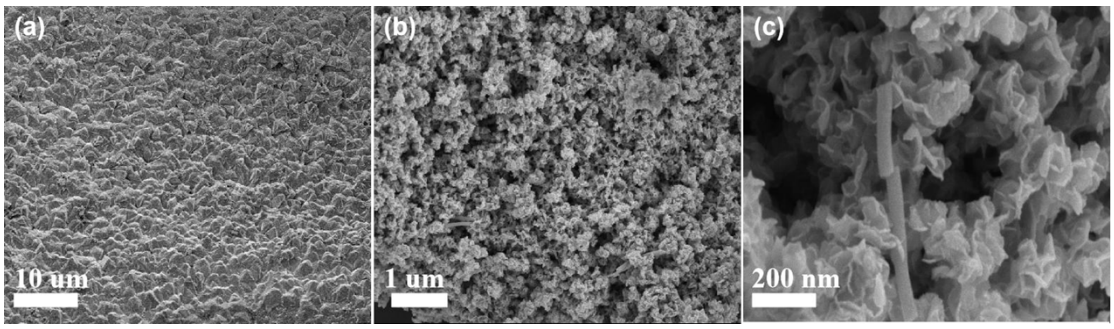

Fig.S1. SEM images of (a) Ni_3S_2/NF and (b-c) MoS_2

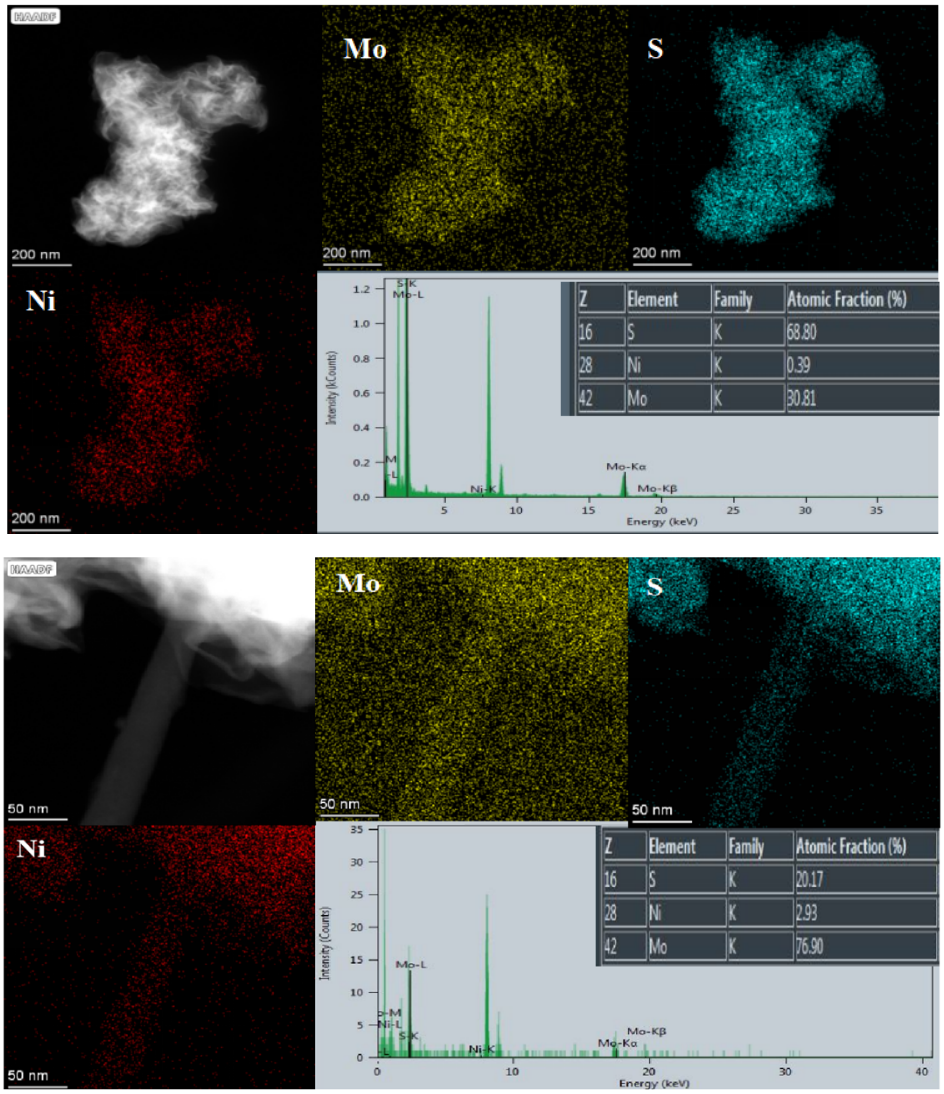

Fig.S2. EDS image of MoS_2/Ni_xS_y/NF

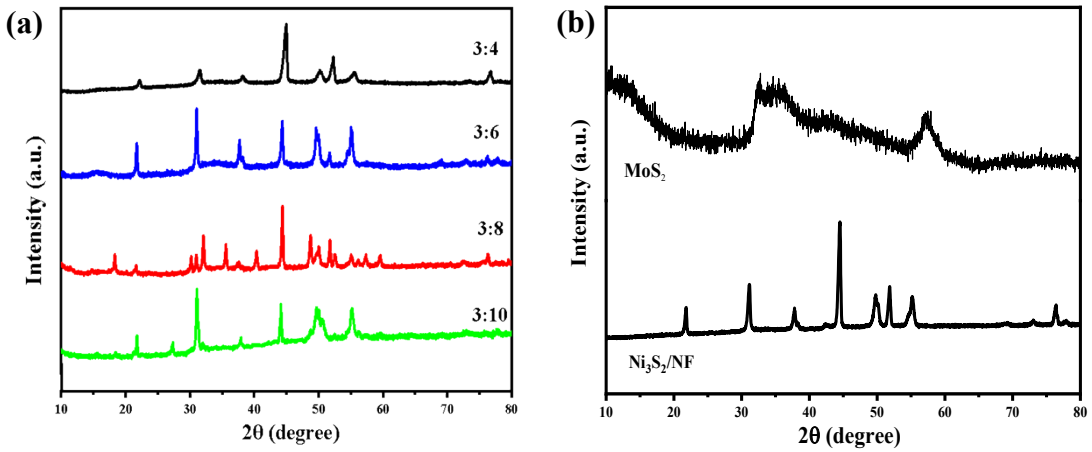

Fig.S3. XRD patterns of (a) catalysts with different sulfur source ratios and (b) the reference catalyst.

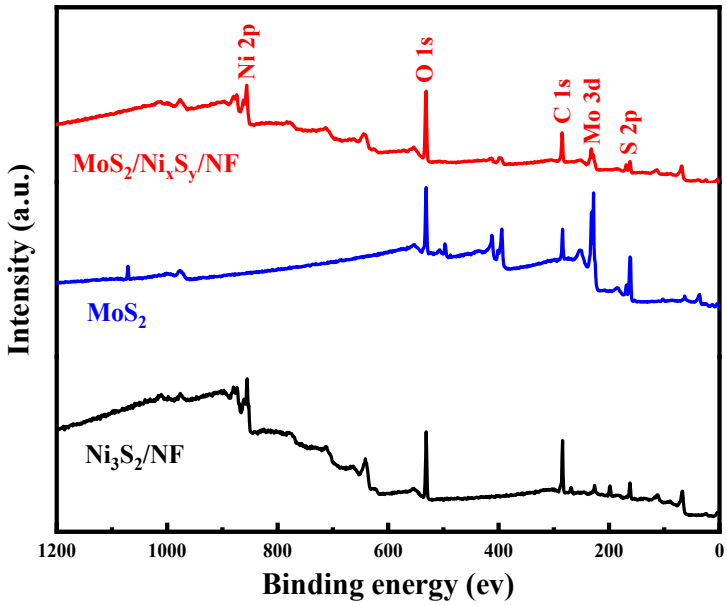

Fig.S4. XPS survey spectrum of $MoS_2/Ni_xS_y/NF$,MoS_2 and Ni_3S_2/NF.

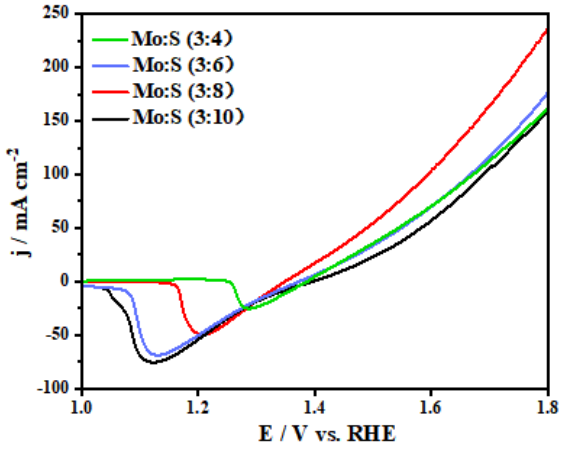

Fig.S5. LSV of catalysts with different sulfur source ratio.

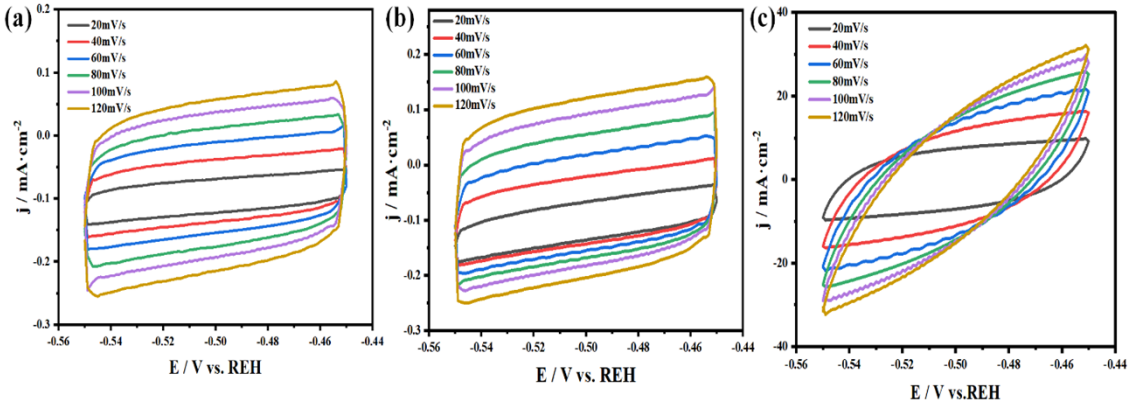

Fig.S6. Cyclic voltammograms (CV) for (a) Ni_3S_2/NF, (b) MoS_2 /NF and (c) MoS_2/Ni_xS_y/NF at different scan rate with 20, 40, 60, 80 ,100 and 120 $mV{\cdot}s^{-1}$.

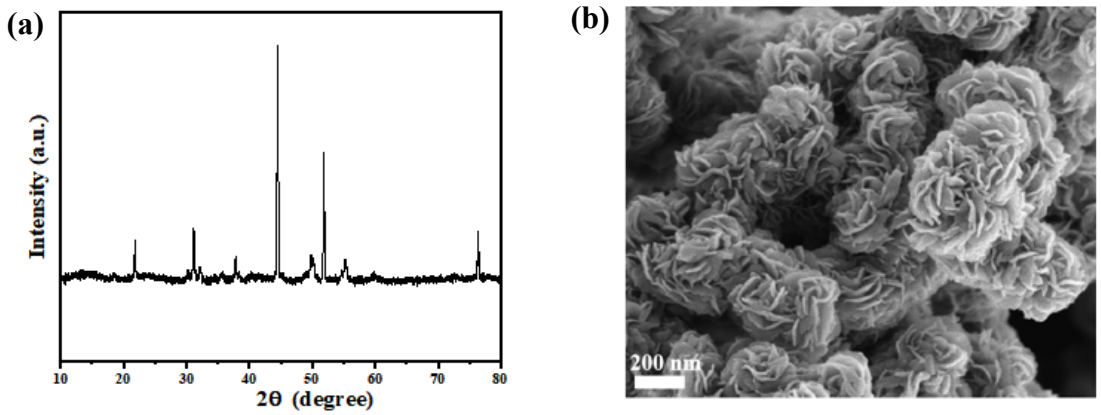

Fig.S7. (a) XRD patterns and (b) SEM images of MoS_2/Ni_xSy/NF after stability testing.

Table.S1. Comparison of the OER performance between the MoS_2/Ni_xS_y/NF catalyst and other electrocatalysts at 10 mA·cm^{-2}.

Sample	OER potential （mV）	Ref.
This work	150	This work
$NiSe_2@MoS_2$	267	[1]
$CMoS_2/NiS_2$	278	[2]
$MoS_2/NiFeS_2$	192	[3]
NiMoS/N	260	[4]
CoxPQDs-$MoS_2@Ni_3S_2$/NF	332	[5]
Co-MoS2/Ni_3S_2-GO/NF	161	[6]
VS-Ni_3S_2/MoS_2	180	[7]
Fe-MoS_2/Ni_3S_2/NF	320	[8]
Ni_3S_2PN/NF	210	[9]
ZrMo-NiS/NF	257	[10]
g-CN/NiS	194	[11]

References

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