Supporting Information

Abundant heterointerfaces in CoS_2/MoS_2 nanosheet array electrocatalysts for enhanced oxygen evolution reaction

Zhaojin Li[†], Qian Ma[†], Shaofei Zhang[†], Di Zhang[†], Huan Wang[†], Qiujun Wang[†], Huilan Sun[†], Bo Wang[†]*

[†] Hebei Key Laboratory of Flexible Functional Materials, School of Materials Science and Engineering, Hebei University of Science and Technology, Hebei 050018 (China)

* Author to whom correspondence should be addressed: School of Materials Science and Engineering, Hebei University of Science and Technology, Hebei 050018 (China)

E-mail addresses：wangbo1996@gmail.com

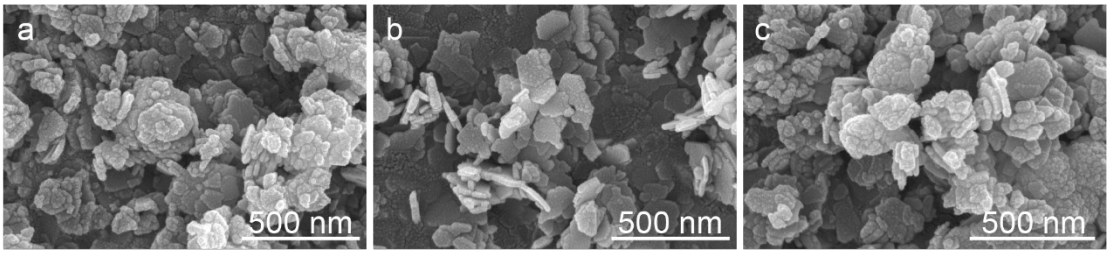

Fig. S1 SEM images of CoS_2/MoS_2 with different Co/Mo ratios: (a) CoS_2/MoS_2-1:2; (b) CoS_2/MoS_2-1:1; (c) CoS_2/MoS_2-2:1

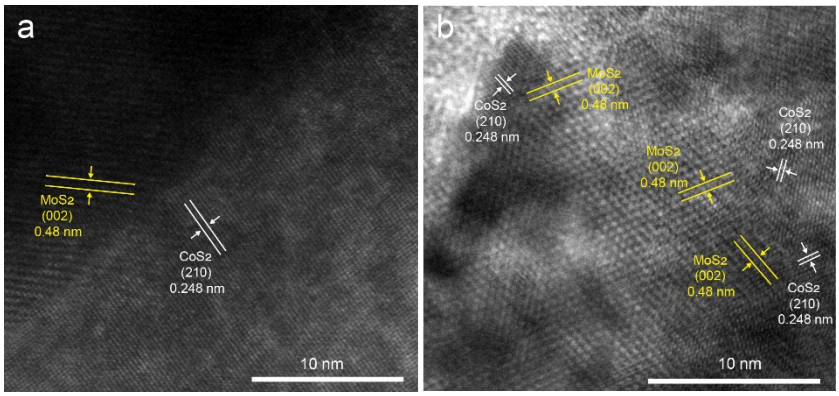

Fig. S2 HRTEM images of the CoS_2/MoS_2-1:1 nanosheets

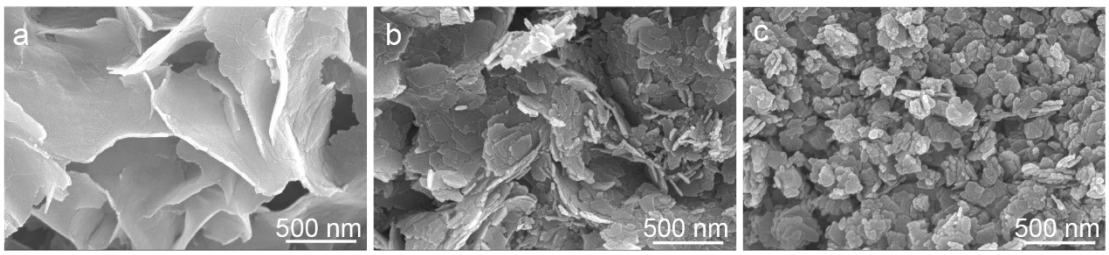

Fig. S3 SEM images of CoS_2/MoS_2-1:1 obtained at different hydrothermal time: (a) 2 h; (b) 4 h; (c) 6 h

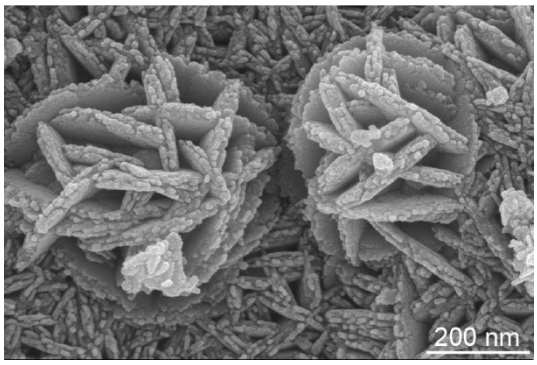

Fig. S4 SEM image of Co/Mo oxide with Co/Mo ratio of 1:1

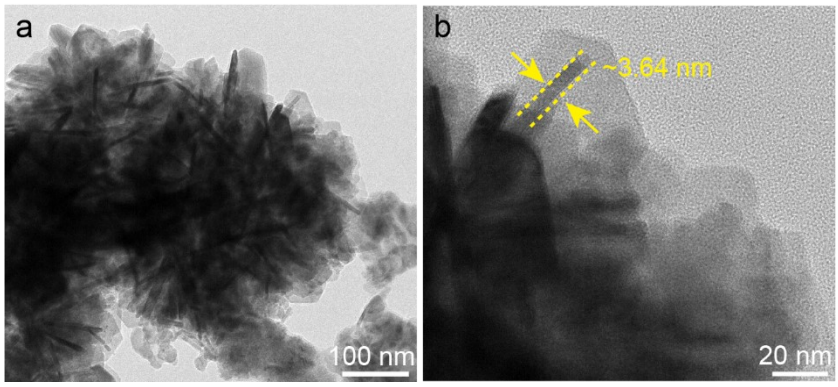

Fig. S5 TEM images of Co/Mo oxide with Co/Mo ratio of 1:1

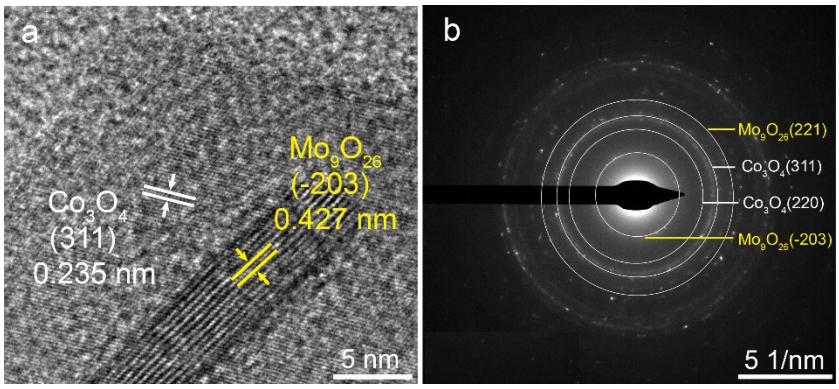

Fig. S6 HRTEM and SAED images of Co/Mo oxide with Co/Mo ratio of 1:1

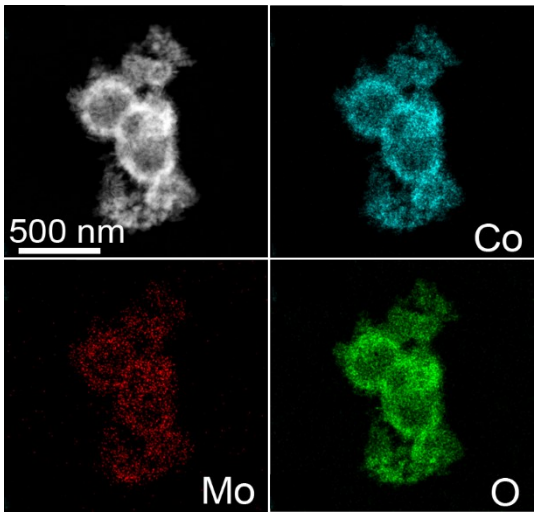

Fig. S7 Elemental mappings of Co/Mo oxide with Co/Mo ratio of 1:1

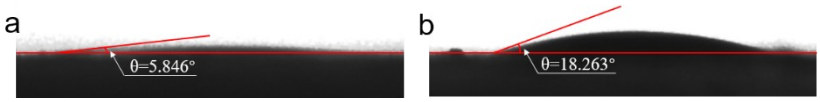

Fig. S8 Contact angle testing: (a) CoS_2/MoS_2-1:1; (b) Co/Mo oxide

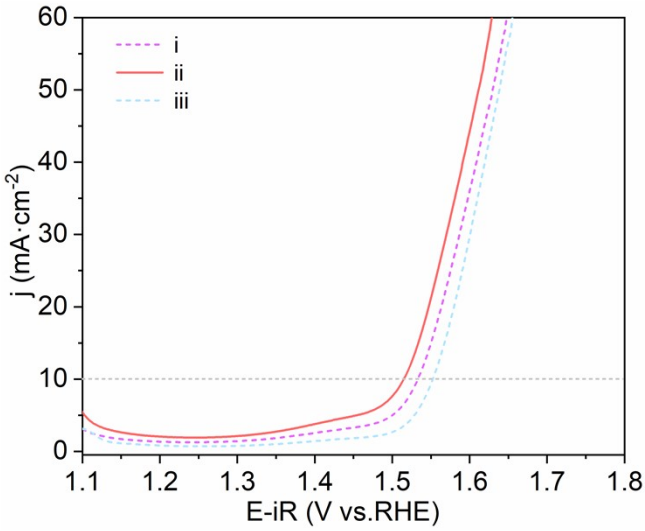

Fig. S9 LSV curves of CoS_2/MoS_2-1:1 with different loads

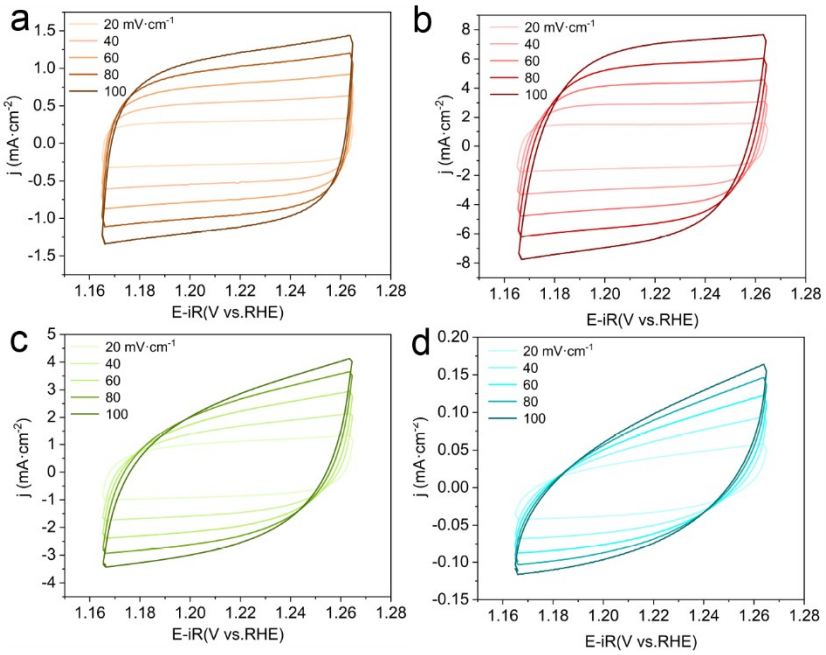

Fig. S10 CVs at different scan rates of in a potential window where no Faradaic processes occur (1.16-1.26 V vs. RHE) for: (a) CoS_2/MoS_2-1:2, (b) CoS_2/MoS_2-1:1, (c) CoS_2/MoS_2-2:1, (d) Co/Mo oxide

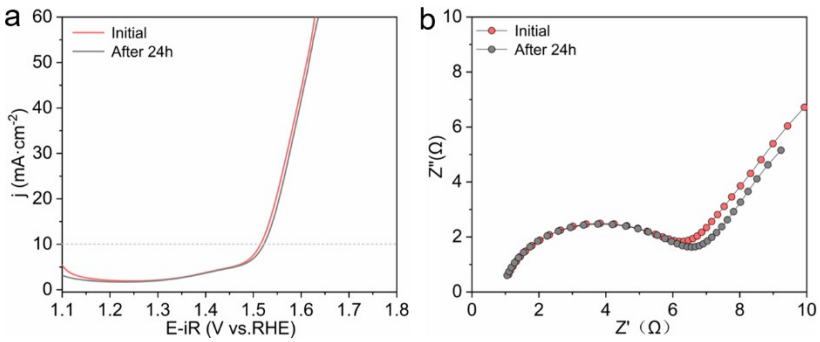

Fig. S11 (a) LSV curves, (b) Nyquist plots of CoS_2/MoS_2-1:1 before and after stability test

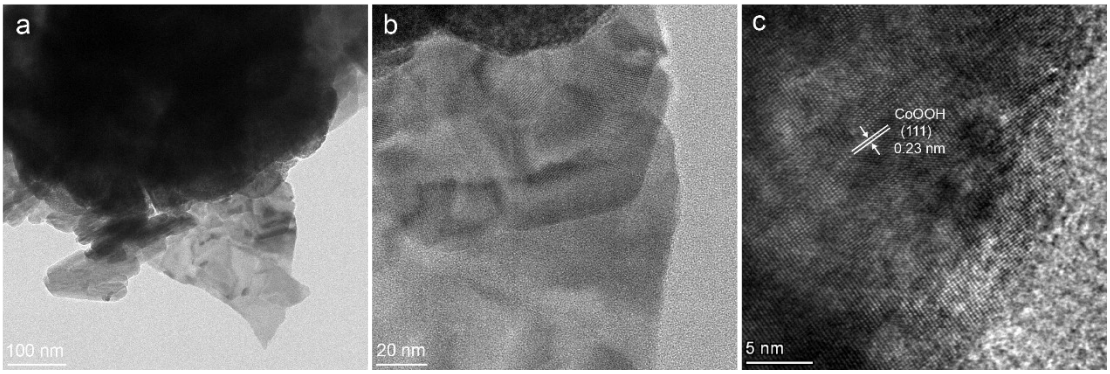

Fig. S12 TEM images of the CoS_2/MoS_2-1:1 sample after reaction

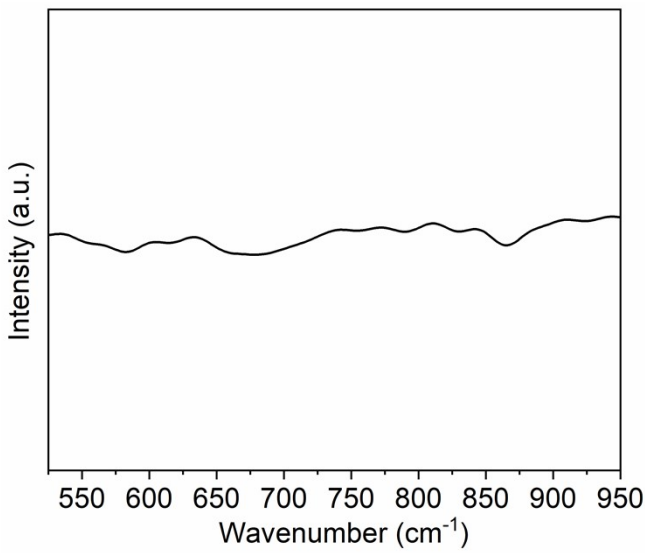

Fig. S13 FTIR spectra of CoS_2/MoS_2-1:1 after reaction

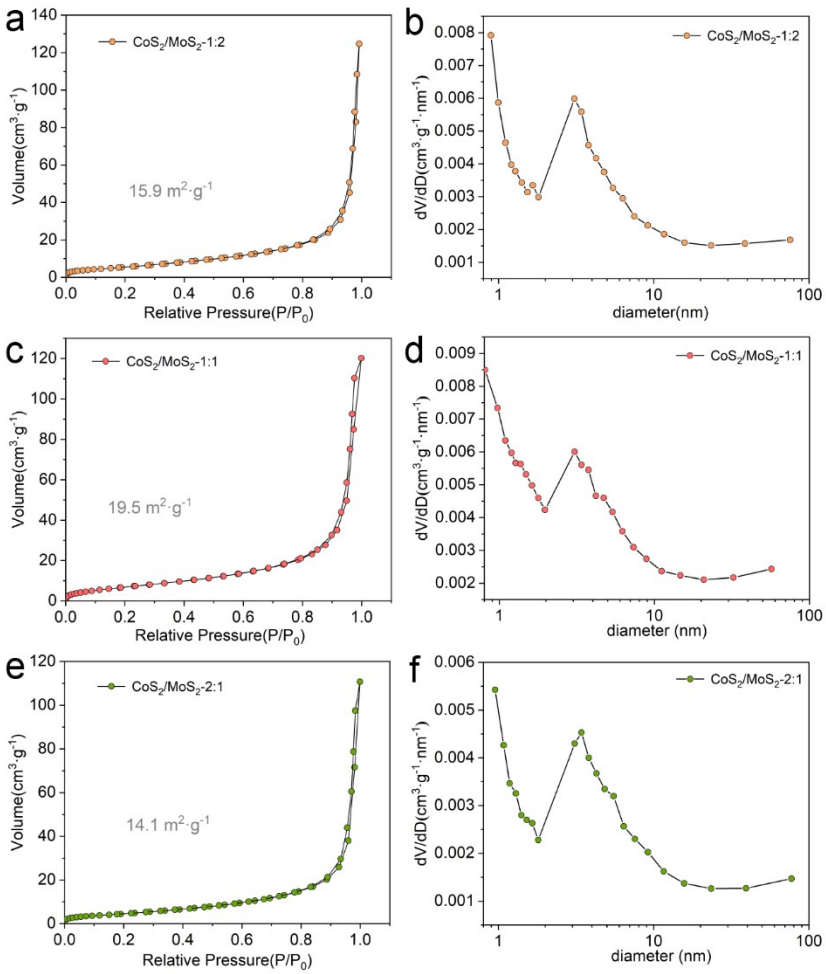

Fig. S14 (a) Nitrogen adsorption-desorption isotherm and (b) pore distribution curves of CoS_2/MoS_2-1:2; (c) Nitrogen adsorption-desorption isotherm and (d) pore distribution curves of CoS_2/MoS_2-1:1; (e) Nitrogen adsorption-desorption isotherm and (f) pore distribution curves of CoS_2/MoS_2-2:1

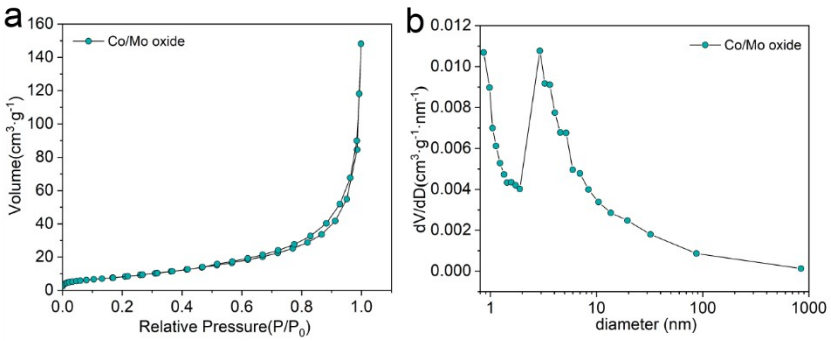

Fig. S15 (a) Nitrogen adsorption-desorption isotherm and (b) pore distribution curves of Co/Mo oxide with Co/Mo ratio of 1:1

Table S1 Mass activity of different samples under certain voltage

Sample	Mass activity($A \cdot g^{-1}$)
Co/Mo oxide	4.09
CoS_2/MoS_2-1:2	14.49
CoS_2/MoS_2-1:1	31.50
CoS_2/MoS_2-2:1	22.16

Table S2 Comparison of Tafel slope and overpotential (10 mA·cm^{-2}) with the electrocatalysts in literature

Materials	Electrolyte	Overpotential /mV	Tafel slope /mV·dec^{-1}	Ref.
MoS_2/NiS	1.0 M KOH	350	108	[S1]
CoS_2/MoS_2	1.0 M KOH	332	125	[S2]
CoS_2-5	1.0 M KOH	290	65.6	[S3]
CoS_2@MoS_2	1.0 M KOH	332	37.5	[S4]
CoS_2-MoS_2 MSHSs	1.0 M KOH	288	62.1	[S5]
CoS NF/CC	1.0 M KOH	310	73.4	[S6]
Fe-CoS_2/CC	1.0 M KOH	304	128	[S7]
MoS_2/CC	1.0 M KOH	503	131	[S8]
meso-Fe-MoS_2/$CoMo_2S_4$	1.0 M KOH	290	65	[S9]
P-CoS	1.0 M KOH	340	73	[S10]
CoS_2/MoS_2	1.0 M KOH	285	105.32	This work

References:

1 Q. Qin, L. Chen, T. Wei and X. Liu, *Small*, 2019, **15**, 1–13.

2 P. Borthakur, P. K. Boruah, M. R. Das, M. M. Ibrahim, T. Altalhi, H. S. El-sheshtawy, S. Szunerits, R. Boukherroub, M. A. Amin, *ACS Appl. Energy Mater*., 2021, **4**, 1269-1285.

3 Y. Zhang, G. Zheng, A. Li, X. Zhu, J. Jiang, Q. Zhang, L. Deng, X. Gao and F. Ouyang, *Inorg. Chem.*, 2022, **61**, 7568-7578.

4 X. Liu, Z. Yin, M. Cui, L. Gao, A. Liu, W. N. Su, S. Chen, T. Ma and Y. Li, J. *Colloid Interface Sci.*, 2022, **610**, 653–662.

5 V. Ganesan and J. Kim, *Int. J. Hydrogen Energy*, 2020, **45**, 13290–13299.

6 Y. Li, X. Fu, W. Zhu, J. Gong, J. Sun, D. Zhang and J. Wang, *Inorg. Chem. Front.*, 2019, **6**, 2090–2095.

7 W. Kong, X. Luan, H. Du, L. Xia and F. Qu, *Chem. Commun.*, 2019, **55**, 2469–2472.

8 Q. Sun, Y. Tong, P. Chen, B. Zhou and X. Dong, *ACS Sustain. Chem. Eng.*, 2021, **9**, 4206–4212.

9 Y. Guo, J. Tang, J. Henzie, B. Jiang, W. Xia, T. Chen, Y. Bando, Y. M. Kang, M. S. A. Hossain, Y. Sugahara and Y. Yamauchi, *ACS Nano*, 2020, **14**, 4141–4152.

10 J. Jiang, J. Xu, W. Wang, L. Zhang and G. Xu, *Chem. - A Eur. J.*, 2020, **26**, 14903–14911.