Electronic Supplementary Material (ESI) for Nanoscale.

Supporting information

Engineering Additional Edge Sites on Molybdenum Dichalcogenides toward Accelerated Alkaline Hydrogen Evolution Kinetics

Qian Zhou[+]*, Guoqiang Zhao*[+]*, Kun Rui, Yaping Chen, Xun Xu*[*]*, Shi Xue Dou, Wenping Sun*[*]

Institute for Superconducting and Electronic Materials, Australian Institute of Innovative Materials, University of Wollongong, Wollongong, NSW 2522, Australia

Email: xun@uow.edu.au; wenping@uow.edu.au

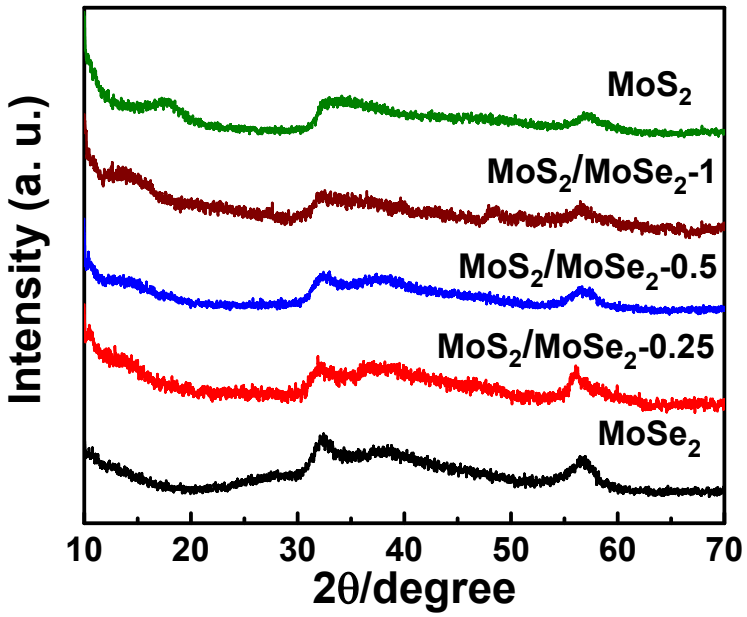

Fig. S1. XRD patterns of MoS_2, $MoSe_2$, and $MoS_2/MoSe_2$-x.

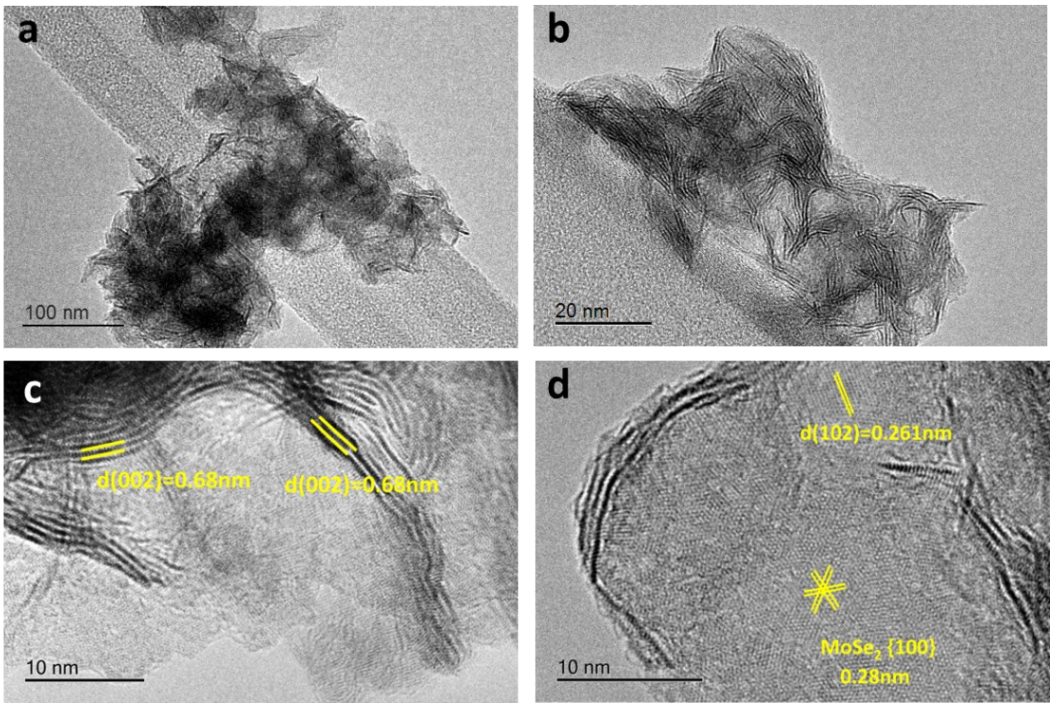

Fig. S2. (a), (b) TEM images and (c), (d) HRTEM images of pristine $MoSe_2$.

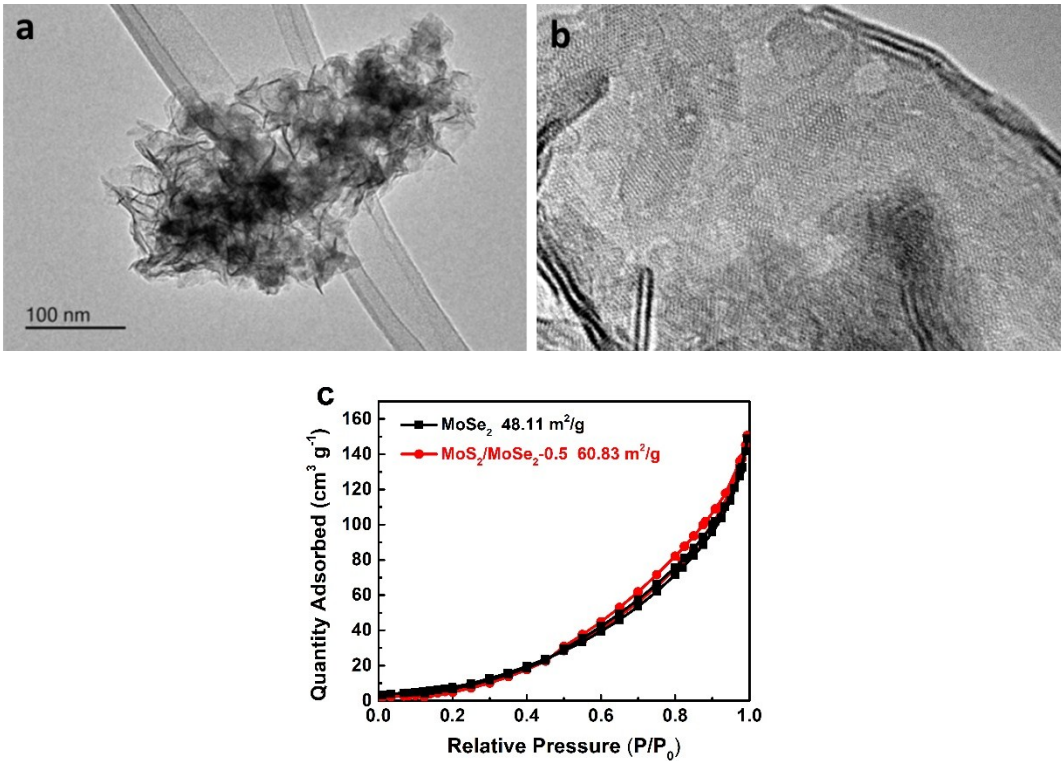

Fig. S3. (a) TEM, (b) HRTEM image of MoS_2/$MoSe_2$-0.5. (c) Nitrogen gas adsorption-desorption isotherms (BET curve) of $MoSe_2$ and MoS_2-$MoSe_2$-0.5, the specific surface areas of $MoSe_2$ and MoS_2-$MoSe_2$-0.5 are determined to be 48 and 61 m^2/g, respectively

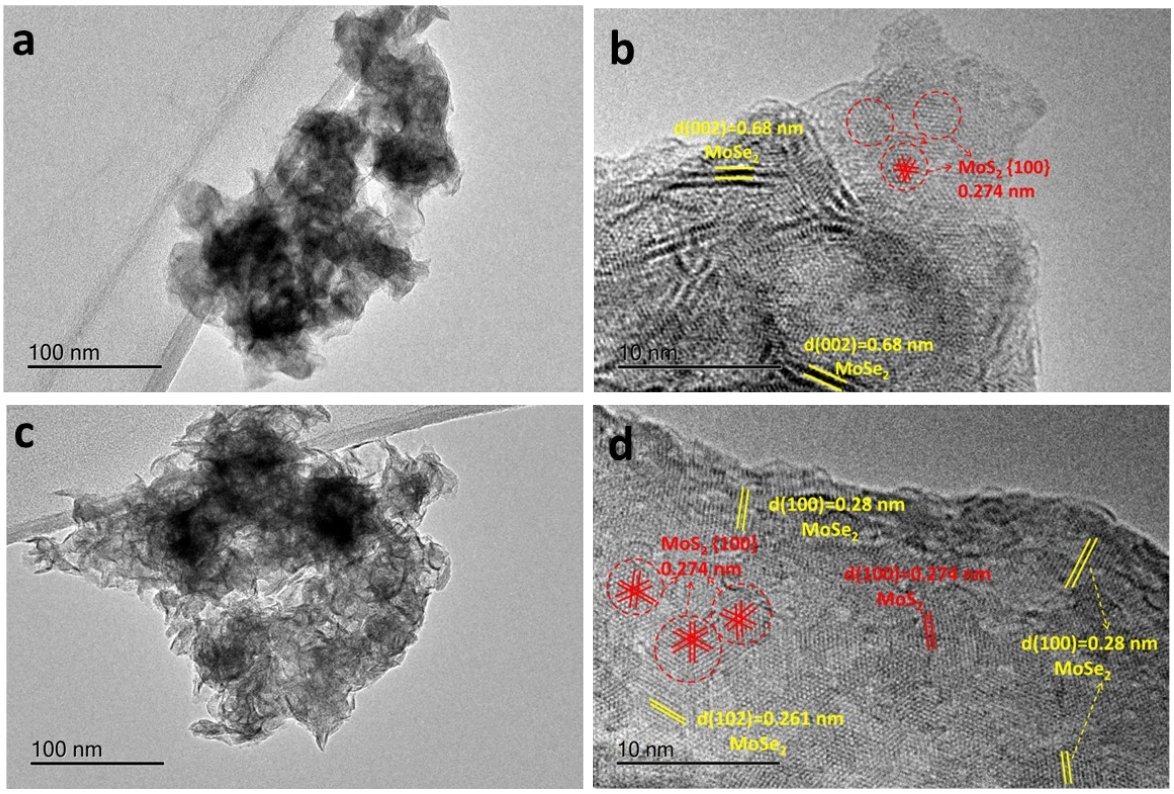

Fig. S4. (a) TEM, (b) HRTEM images of $MoS_2/MoSe_2$-0.25; (c) TEM, (d) HRTEM images of $MoS_2/MoSe_2$-1.

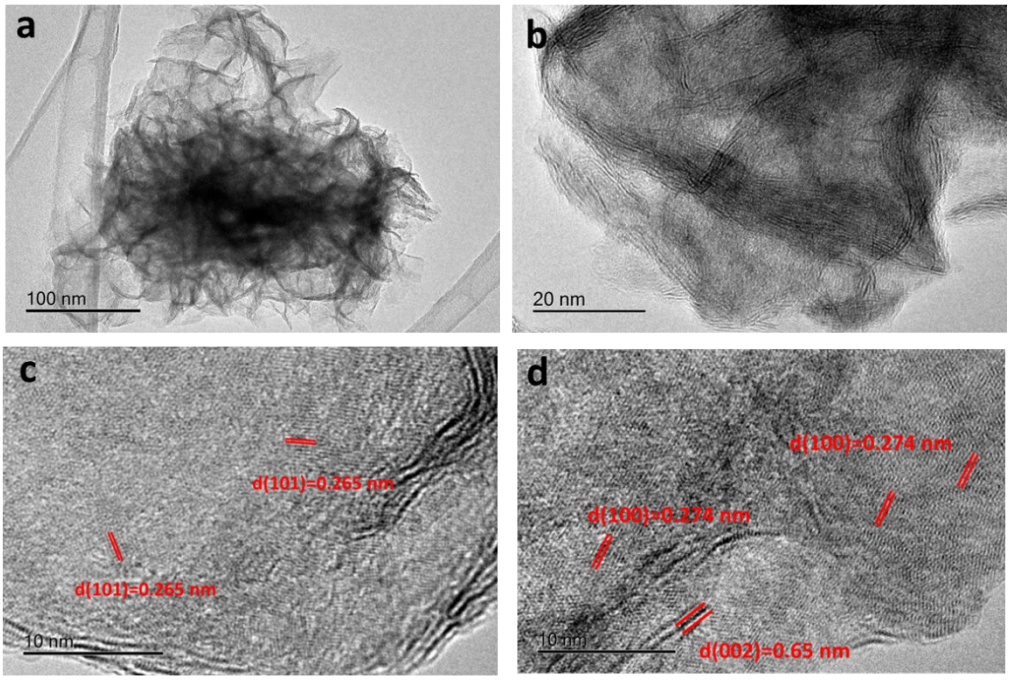

Fig. S5. (a), (b) TEM images and (c), (d) HRTEM images of pure MoS_2.

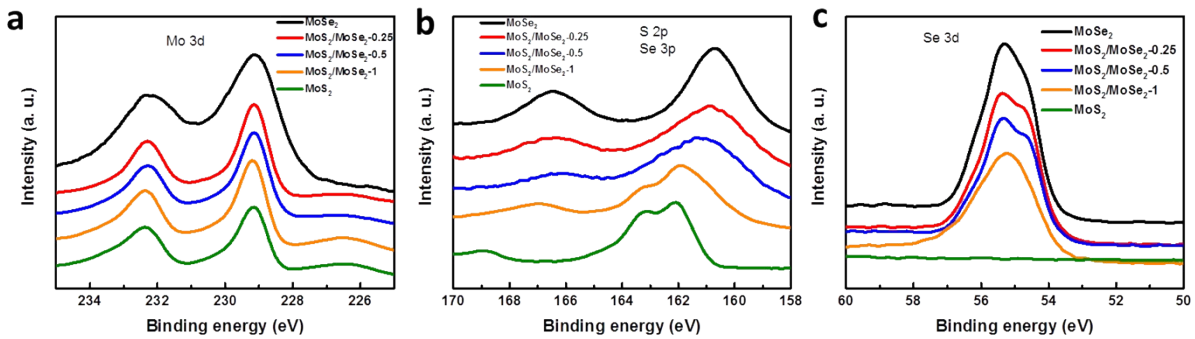

Fig. S6. (a) Mo 3d, (b) S 2p & Se 3p, (c) Se 3d XPS spectra of $MoSe_2$, MoS_2, and $MoS_2/MoSe_2$-x heterostructures.

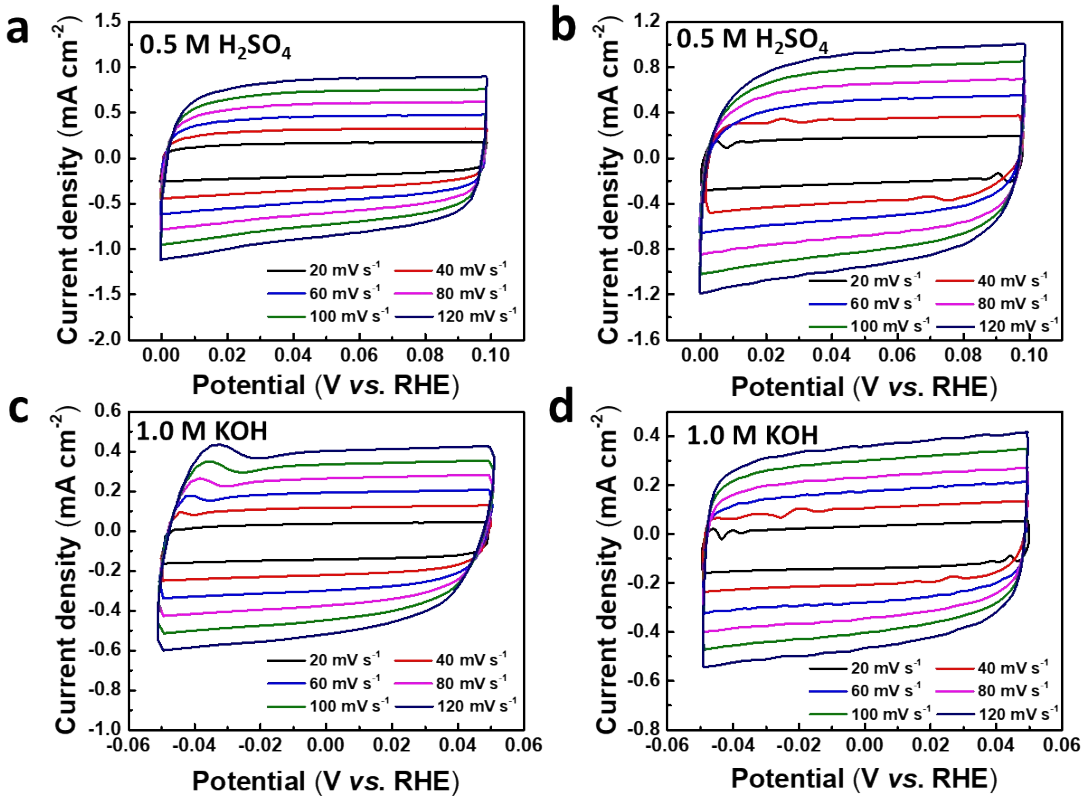

Fig. S7. CV curves of (a) (c) $MoS_2/MoSe_2$-0.5 and (b) (d) $MoSe_2$ electrode in 0.5 M H_2SO_4 and 1M KOH and with different scan rates.

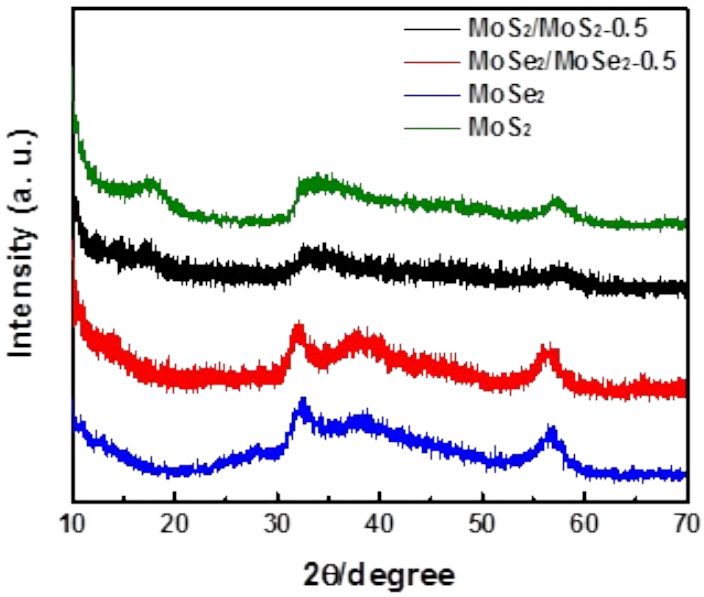

Fig. S8. XRD pattern of $MoSe_2$, MoS_2, $MoSe_2$/$MoSe_2$-0.5, and MoS_2/MoS_2-0.5.

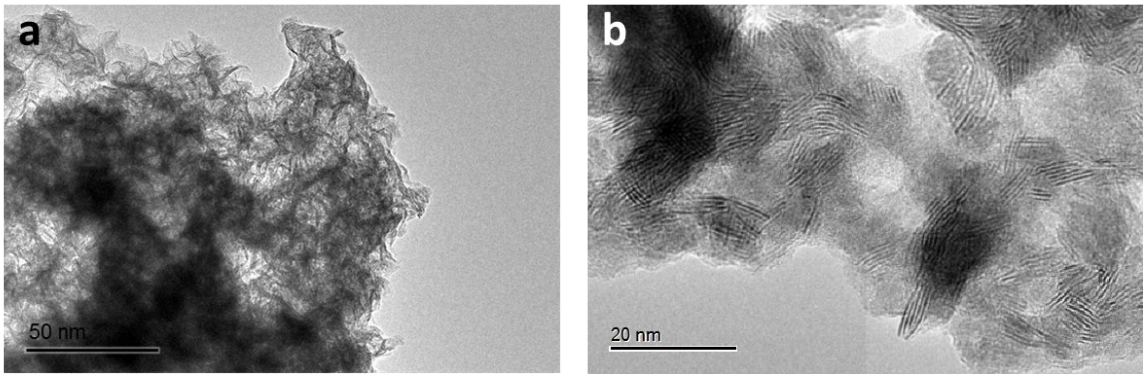

Fig. S9. (a), (b) TEM images of $MoSe_2$/$MoSe_2$-0.5.

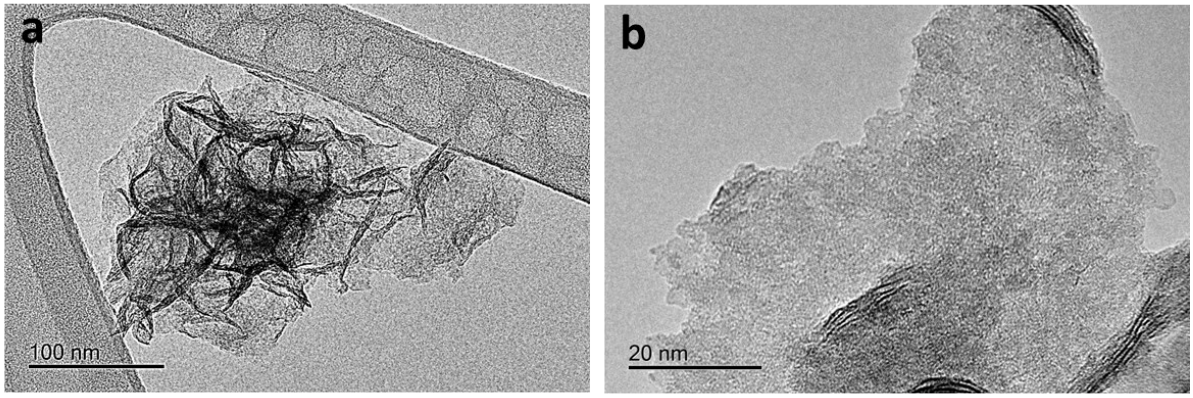

Fig. S10. (a), (b) TEM images of MoS_2/MoS_2-0.5.

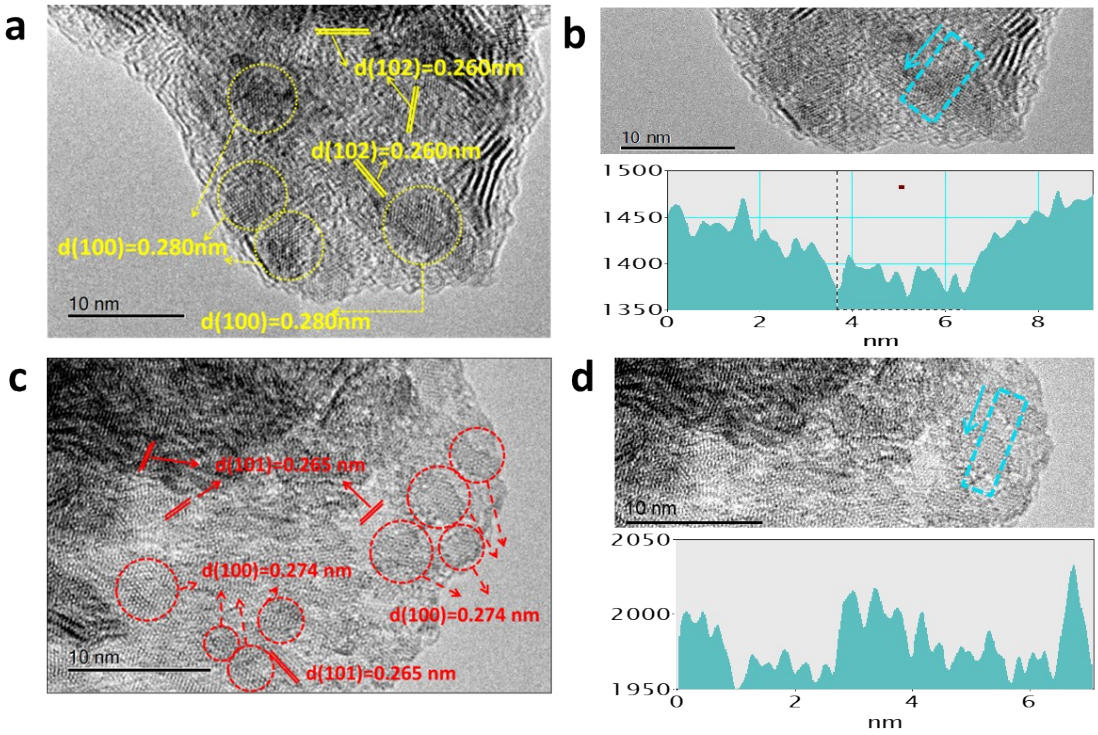

Fig. S11. TEM images of (a) $MoSe_2$/$MoSe_2$-0.5 and (c) MoS_2/MoS_2-0.5; Intensity profile of (b) $MoSe_2$/$MoSe_2$-0.5 and (d) MoS_2/MoS_2-0.5.

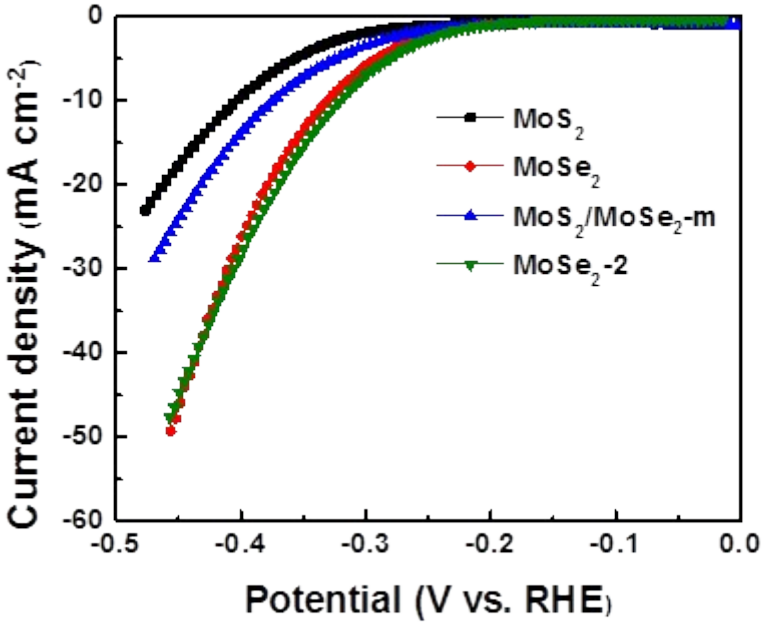

Fig. S12. (a) iR-corrected LSV curves measured at a scan rate of 5 mV s^{-1} in 1M KOH solution.

Table S1 HER performance comparison of MoS_2-based and $MoSe_2$-based materials in alkaline solution.

Catalyst	Substrate	Electrolyte	Overpotential (mV @ 10 mA cm^{-2})	Reference
$MoS_2/MoSe_2$	GC	1.0 M KOH	235	This work
$Ni(OH)_2/MoS_2$	GC	1.0 M KOH	227	1
$CoSe_2/MoSe_2$	GC	1.0 M KOH	218	2
$MoSe_2$-$CoSe_2$ NTs	GC	1.0 M KOH	237	3
GwC–$MoSe_2$	GC	1.0 M KOH	~350	4
$Ni(OH)_2/MoS_2$	CC	1.0 M KOH	80	5
MoS_2/NiCo-LDH	CFP	1.0 M KOH	78	6
MoS_2/G	NF	0.1 M KOH	>600	7
MoS_{2+x} nanoparticles	FTO	1.0 M KOH	310	8
ex-$MoSe_2$:$NiCl_2$	NM	1.0 M KOH	273	9
$MoSe_2$/GCA	NF	1.0 M KOH	~300	10
$MoSe_2$:CdS NHDs	PG	0.1 M KOH	~500	11
$MoSe_2/MoO_3$	PG	0.1 M KOH	270	12
$MoSe_2@Ni_{0.85}Se$	NF	1.0 M KOH	117	13

Note: GC = Glassy Carbon CC = Carbon Cloth CFP = Carbon Fiber Paper FTO = Fluorine-doped Tin Oxide NM = Nylon Membranes NF = Nickel Foam PGE = Pencil Graphite

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