Supporting Information

2D Organ-like Molybdenum Carbide (MXene) Coupled with MoS_2 Nanoflowers Enhances the Catalytic Activity in the Hydrogen Evolution Reaction

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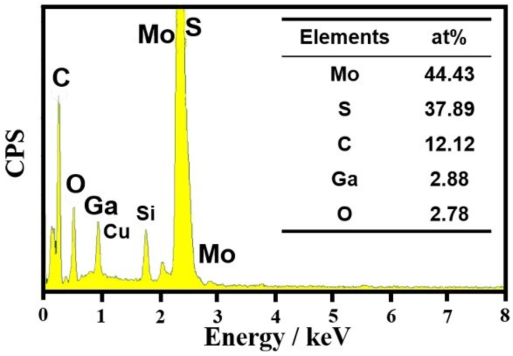

Fig. S1 EDX spectrum of $MoS_2@Mo_2CT_x$.

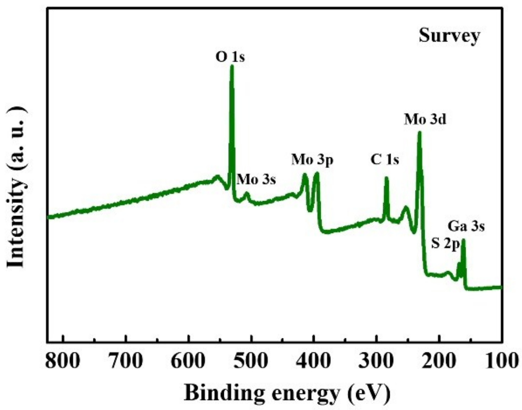

Fig. S2 XPS survey spectra of $MoS_2@Mo_2CT_x$ nanohybrids

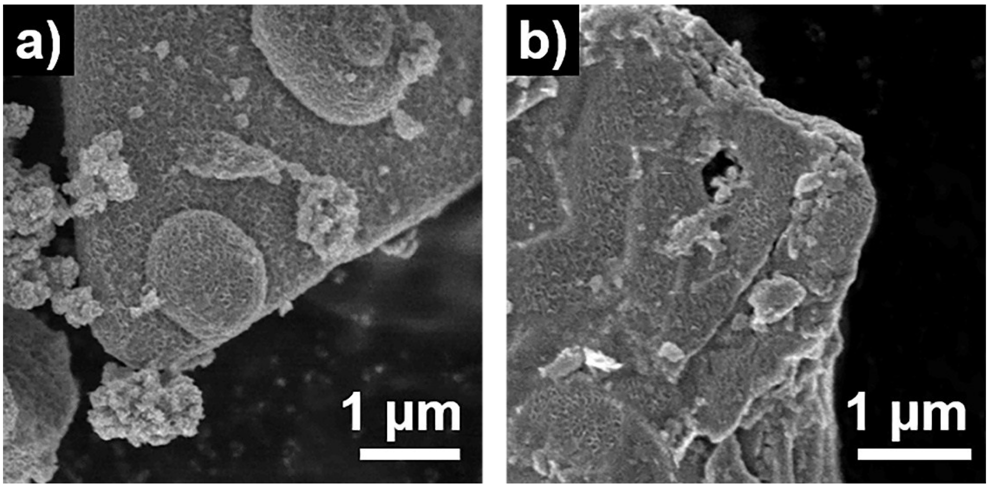

Fig. S3 (a) SEM of $MoS_2@Mo_2CT_x$ at the beginning of HER; (b) SEM of the composite after 8 hours.

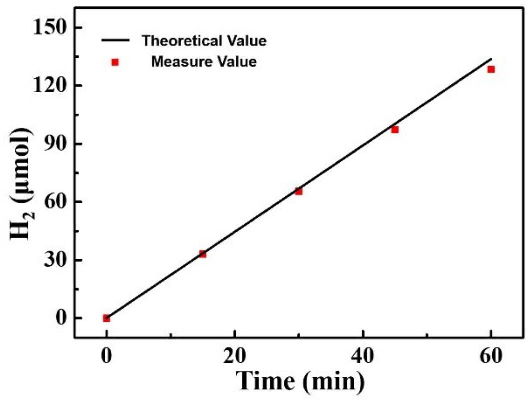

Fig. S4 Electrocatalytic efficiency of H_2 production on $MoS_2@Mo_2CT_x$ at a potential of ca. -400 mV, measured for 60 min.

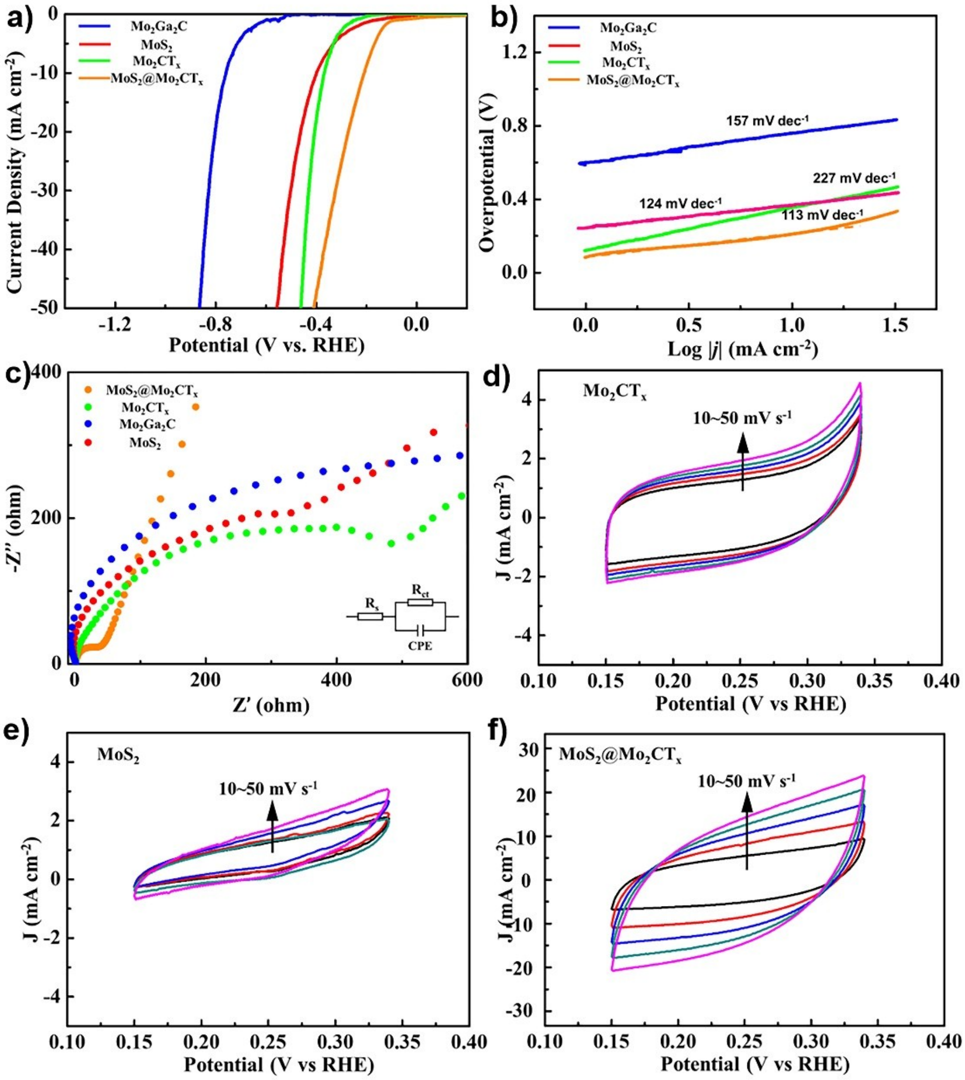

Fig. S5 (a) Polarization curves of different materials at a scanning rate of 10 mV s^{-1} in 0.5 M H_2SO_4; (b) Tafel plots of different materials; (c) EIS spectra of different materials over the frequency range from 100 kHz to 10 Hz at η = 400; cyclic voltammograms of MoS_2@Mo_2CT_x, within different rates ranging from 10 to 50 mV s^{-1} in the region from 0.15 to 0.34 V.

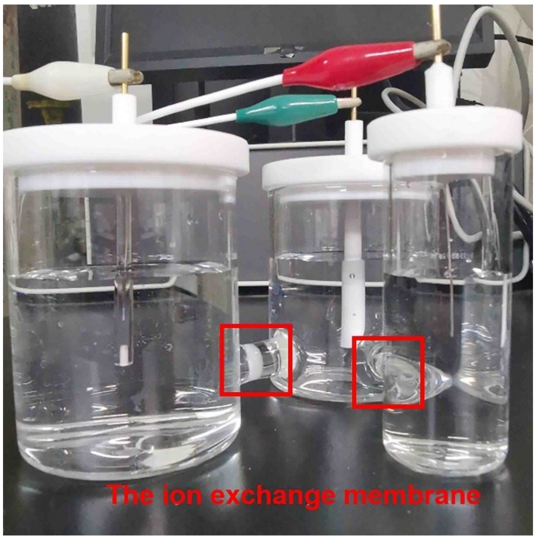

Fig. S6 Digital photograph of the three-electrode system with the ion exchange membrane. The commercial Pt/C electrode and Ag/AgCl electrode were used as the counter electrode and reference electrode respectively.

Table S1 A comparison of $MoS_2@Mo_2CT_x$ electrocatalyst with recently reported non-noble metal catalysts in HER performance (1 M KOH).

Catalysts	Overpotential at j=10 mA cm^{-2}(mV)	Tafel slope (mV dec^{-1})	References	Cites
$MoS_2@Mo_2CT_x$	**176**	**207**	**This work**	
MoS_2/Ti_3C_2-MXene@C	135	45	*Adv. Mater.*, 2017, **29**, 1607017	S1
Mo_2C@2D-NPC	45	52	*ACS Nano*, 2017, **4**, 3933-3942	S2
Mo_2C	195	67	*ACS Nano*, 2017, **4**, 3933-3942	S2
Co^{3+}-Cr_2CT_x	404	137	*J. Am. Chem. Soc.,* 2019, **141**, 9610-9616	S3
Nb-doped $Ti_3C_2T_x$ MXene	445	154	*Adv. Sci.*, 2019, **11**, 1900116.	S4
N,P-doped Mo_2C@C	156	87	*ACS Nano,* 2016, **9**, 8851-8860	S5
Mo_2CT_x:Co	180	59	*J. Am. Chem. Soc.,* 2019, **141**, 17809-17816	S6
2H $MoSe_2/Ti_3C_2$ MXene	152	211	*Electrochim. Acta,* 2019, **326**, 134976	S7

Table S2 A comparison of MoS_2@Mo_2CT_x electrocatalyst with recently reported non-noble metal catalysts in HER performance (0.5 M H_2SO_4).

Catalysts	**Overpotential at j=10 mA cm^{-2}(mV)**	**Tafel slope (mV dec^{-1})**	**References**	**Cites**
MoS_2@Mo_2CT_x	**176**	**113**	**This work**	
Ti_2C	609	124	*ACS Energy Lett.*, 2016, 1(**3**), 589-594	S8
Mo_2C	283	82	*ACS Energy Lett.*, 2016, 1(**3**), 589-594	S8
Mo_2CT_x	189	75	*ACS Energy Lett.*, 2016, 1(**3**), 589-594	S8
L-Mo_2C	145	157	*ACS Appl. Mater. Interfaces*, 2018, **47**, 40500-40508	S9
Ti_3C_2 Flakes	390	188	*ACS Sustain. Chem. Eng.*, 2018, **6**, 8976-8982	S10
Layered-Ti_2CT_x (F-term)	265	138	*Nano Energy*, 2018, **47**, 512-518	S11
N-Ti_2CT_x	215	67	*J. Mater. Chem. A*, 2018, **6**, 20869-20877	S12

Supplementary References

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