

## Supplementary Information

### **Pt nanoparticles anchored by oxygen vacancies in MXene for efficient electrocatalytic hydrogen evolution reaction**

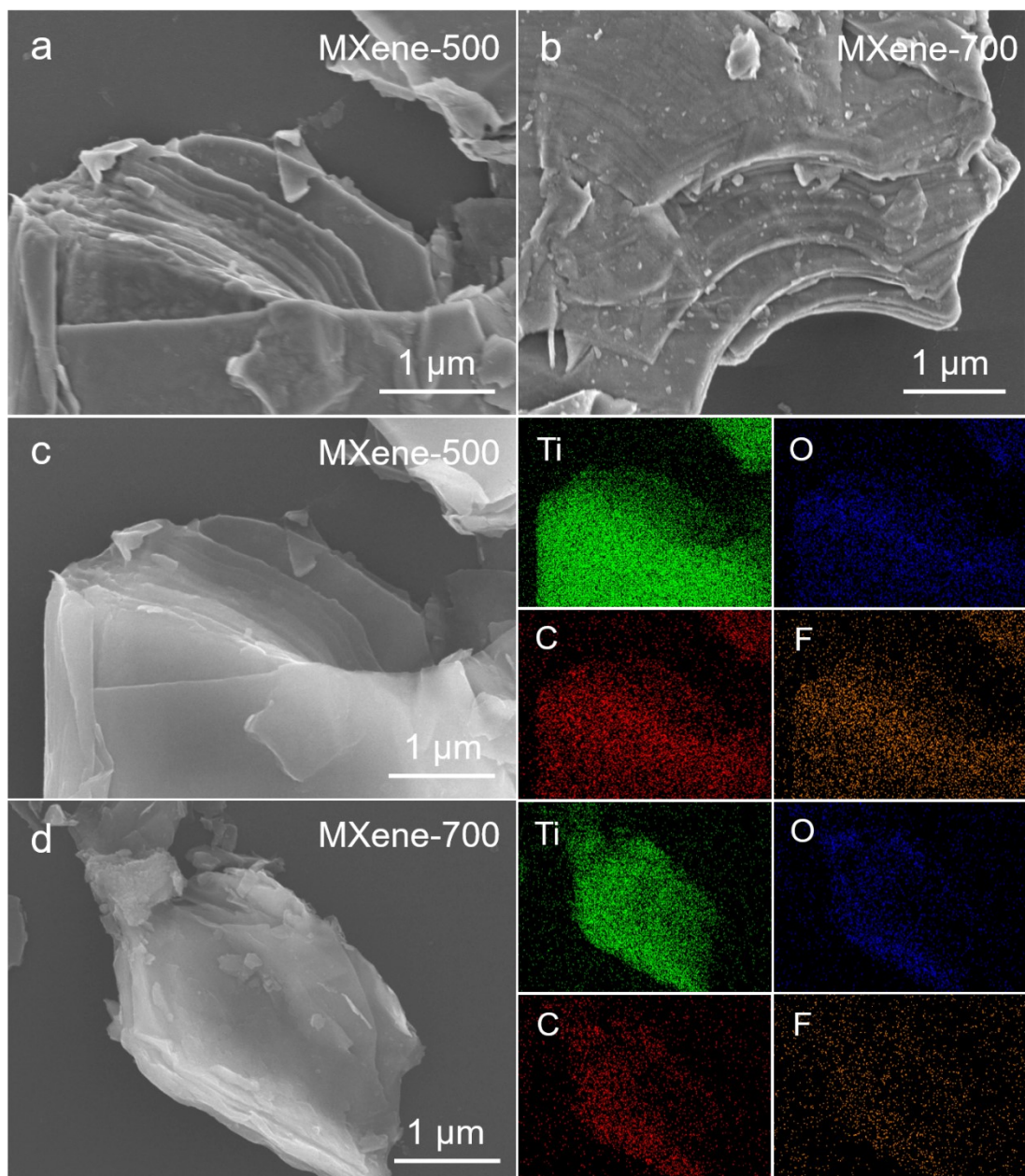
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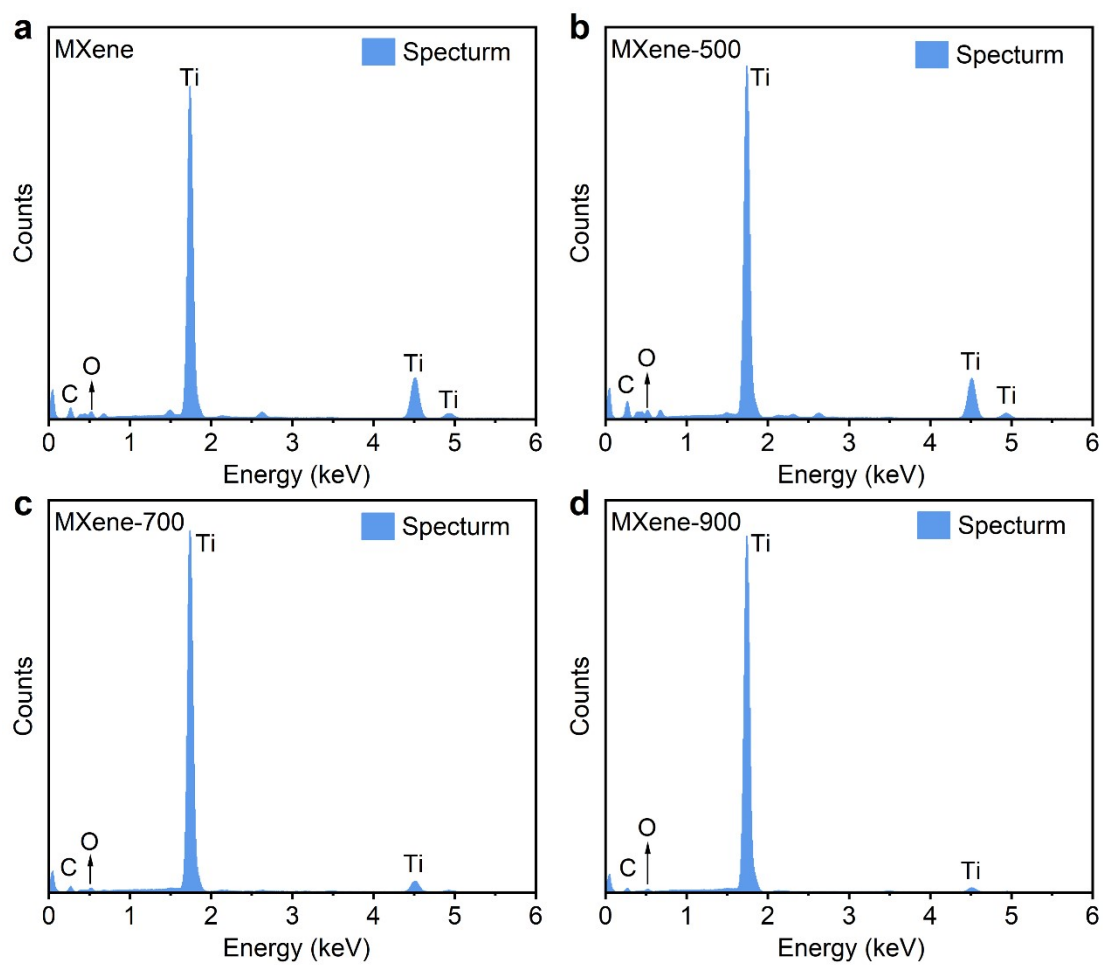
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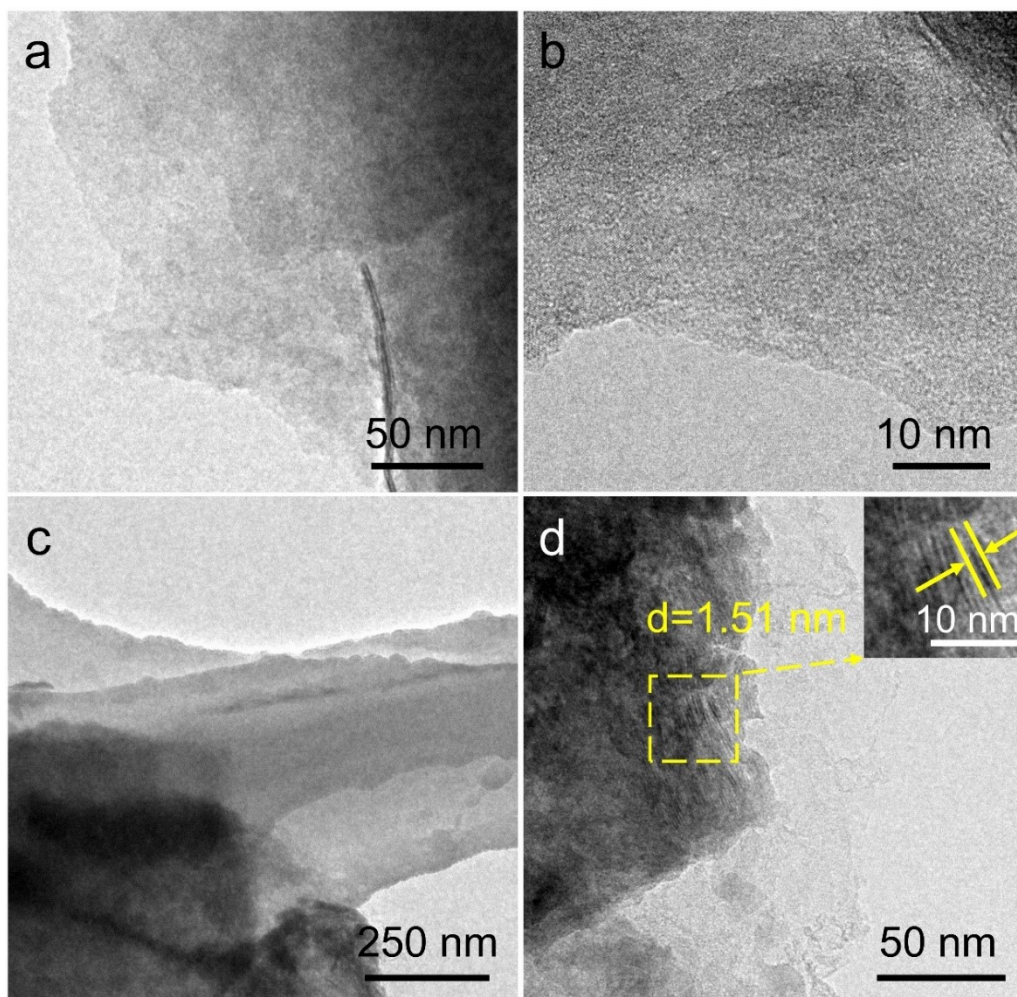
E-mail address: [wp Xiao@njfu.edu.cn](mailto:wp Xiao@njfu.edu.cn)



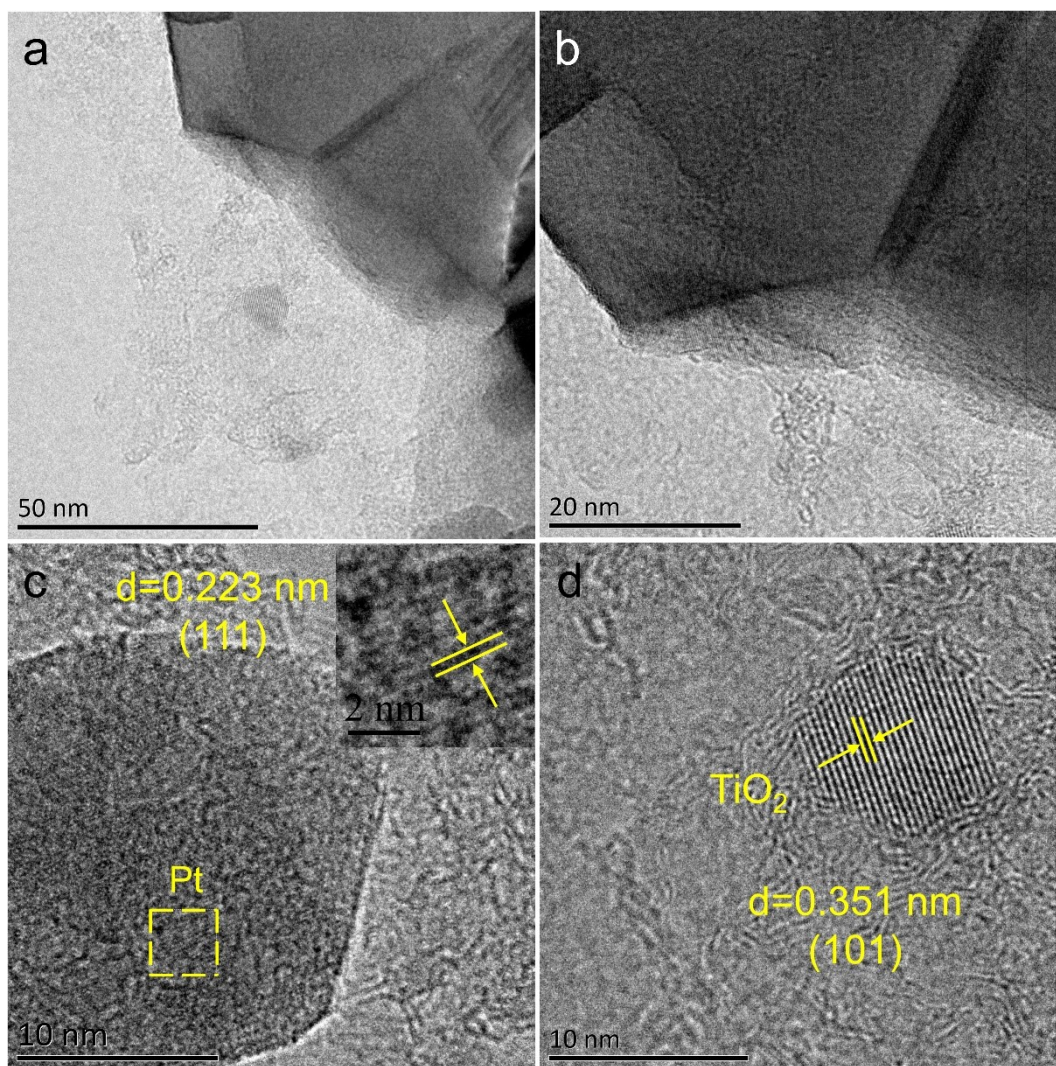
**Fig. S1** SEM images of (a) MXene-500 and (b) MXene-700. EDS elemental mapping images of (c) MXene-500 and (d) MXene-700.



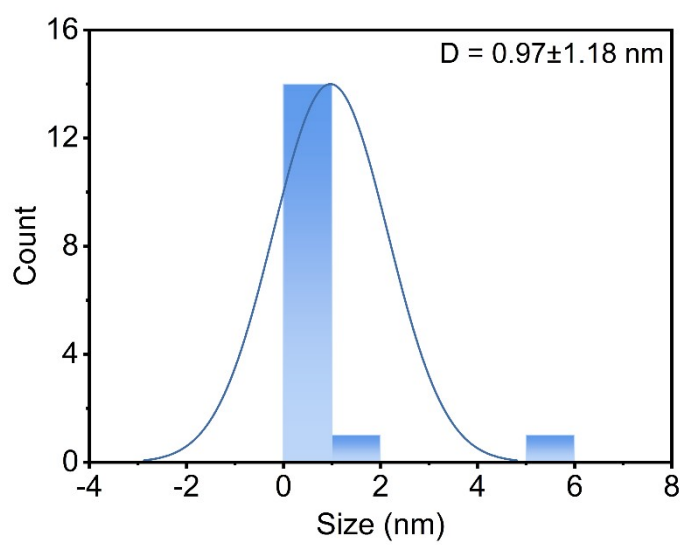
**Fig. S2** EDS spectrums of MXene, MXene-500, MXene-700 and MXene-900 catalysts.



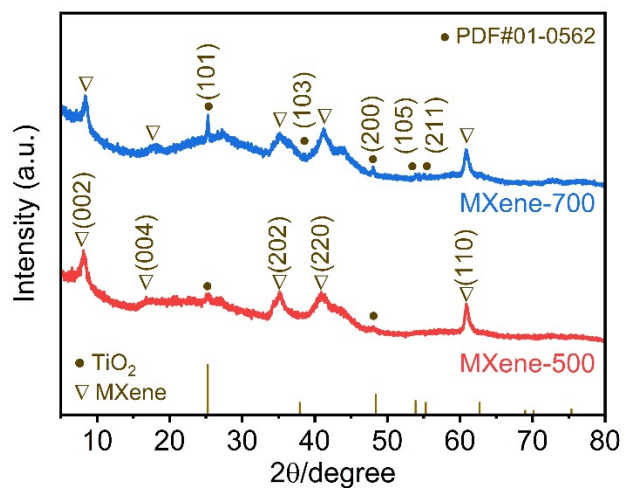
**Fig. S3** TEM images of (a, b) MXene and (c, d) MXene-900.



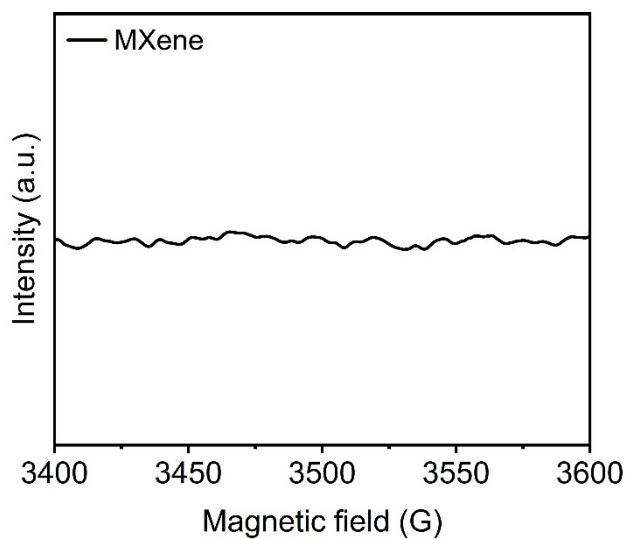
**Fig. S4** TEM and HRTEM images of 0.05-Pt/MXene-900.



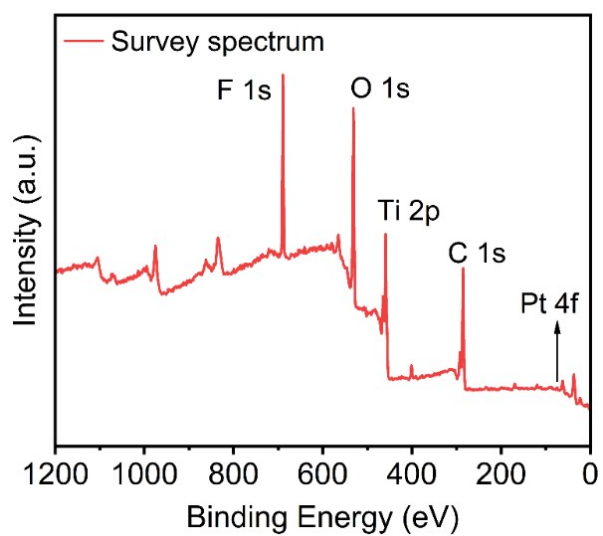
**Fig. S5** Particle size distribution of 0.05-Pt/MXene-900 catalyst.



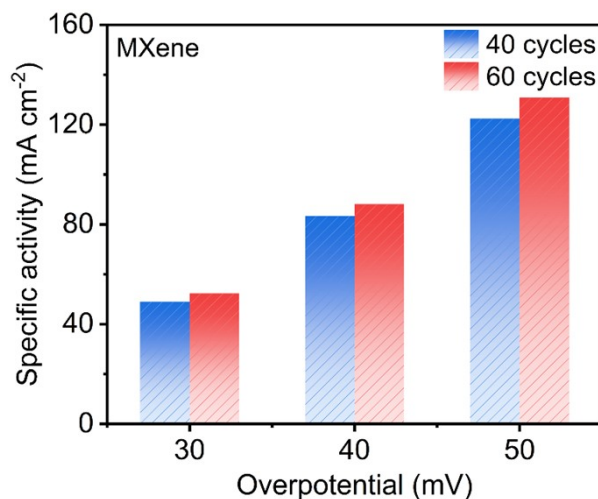
**Fig. S6** XRD pattern of MXene-500 and MXene-700 catalysts.



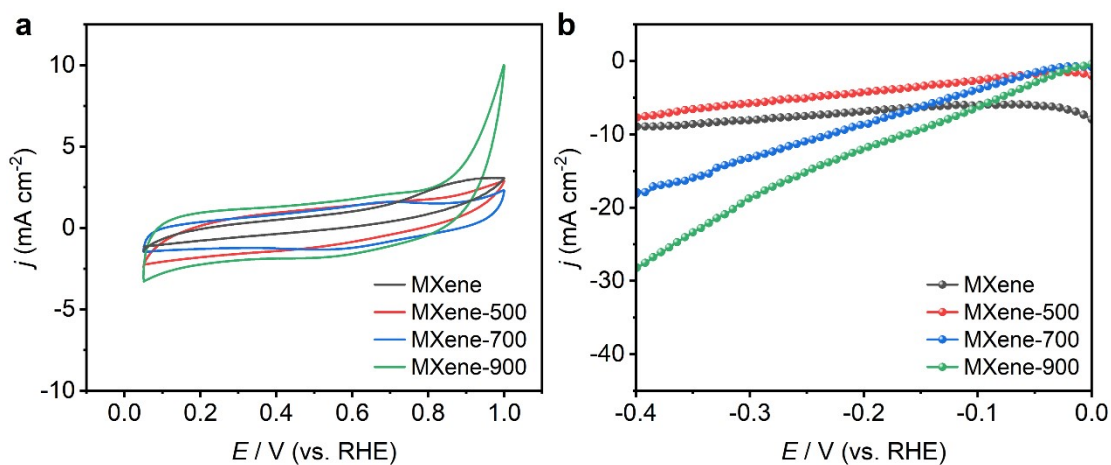
**Fig. S7** EPR of MXene.



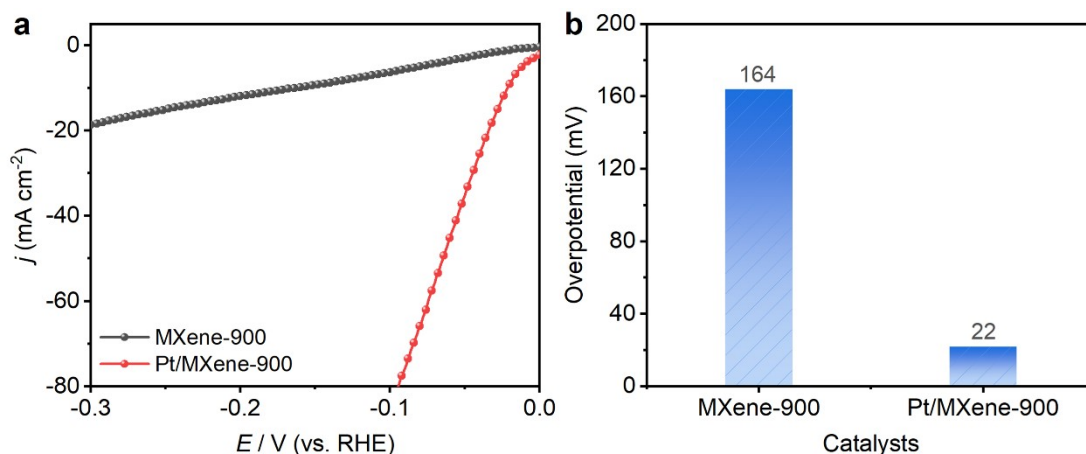
**Fig. S8** Survey XPS data of 0.05-Pt/MXene-900 catalyst.



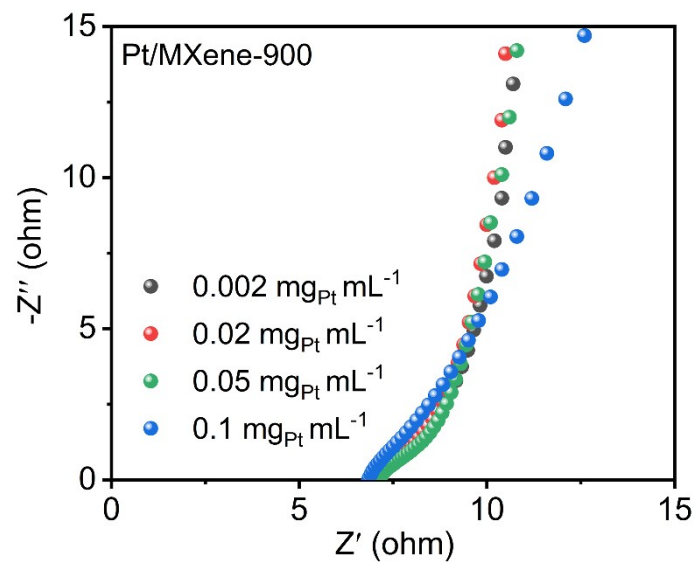
**Fig. S9** Specific activities of 0.2-Pt/MXene with deposition turns of 40, 60 circles.



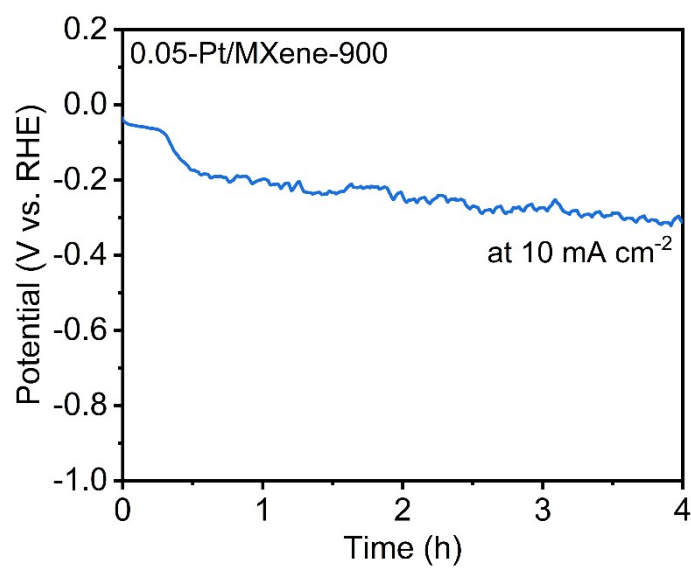
**Fig. S10** (a) CV curves and (b) LSV curves of MXene, MXene-500, MXene-700 and MXene-900 catalysts in 0.5 M H<sub>2</sub>SO<sub>4</sub> solution.



**Fig. S11** (a) LSV curves and (b) Overpotentials of MXene-900 and 0.05-Pt/MXene-900 catalysts in 0.5 M H<sub>2</sub>SO<sub>4</sub> solution.



**Fig. S12** Nyquist plots of 0.002-Pt/MXene-900, 0.02-Pt/MXene-900, 0.05-Pt/MXene-900 and 0.1-Pt/MXene-900 in 0.5 M H<sub>2</sub>SO<sub>4</sub> for a deposition number of 60 circles.



**Fig. S13** Chronopotentiometric curve of 0.05-Pt/MXene-900 measured at 10 mA cm<sup>-2</sup> in 0.5 M H<sub>2</sub>SO<sub>4</sub>.



**Table S1.** Comparison of HER catalytic activity of the fabricated 0.05-Pt/MXene-900 catalyst with other recently reported catalysts in 0.5 M H<sub>2</sub>SO<sub>4</sub> electrolyte.

Catalysts	Overpotential (mV)	Tafel Slope (mV dec <sup>-1</sup> )	Ref.
0.05-Pt/MXene-900	22	42.41	This work
CoRe/CP	45.1	40	1
Ni <sub>3</sub> N/Ni@C750	172	63	2
NiSe <sub>2</sub> @NC-500 °C	161	63.2	3
MoS <sub>2</sub> /CoS <sub>2</sub> - 2@Mo <sub>2</sub> TiC <sub>2</sub> T <sub>x</sub>	80	108.3	4
NiMoP/C	62	91	5
Rh-WO <sub>3</sub>	48	84	6
Co/MoS <sub>2</sub> @NPC	139	69	7
Ni-Ti <sub>3</sub> C <sub>2</sub>	187.25	67.21	8
Ru/MoO <sub>2</sub>	39	50	9
Rh-Rh <sub>2</sub> S <sub>3</sub> /C	30	33.1	10
NiS <sub>2</sub> /Co <sub>3</sub> S <sub>4</sub>	253	62	11
CoRu/CNTs@Ti <sub>3</sub> C <sub>2</sub>	74	80	12

## References

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