Supplementary Information

Electrospun Nanofibers of 2D Cr_2CT_x MXene Embedded in PVA for Efficient Electrocatalytic Water Splitting

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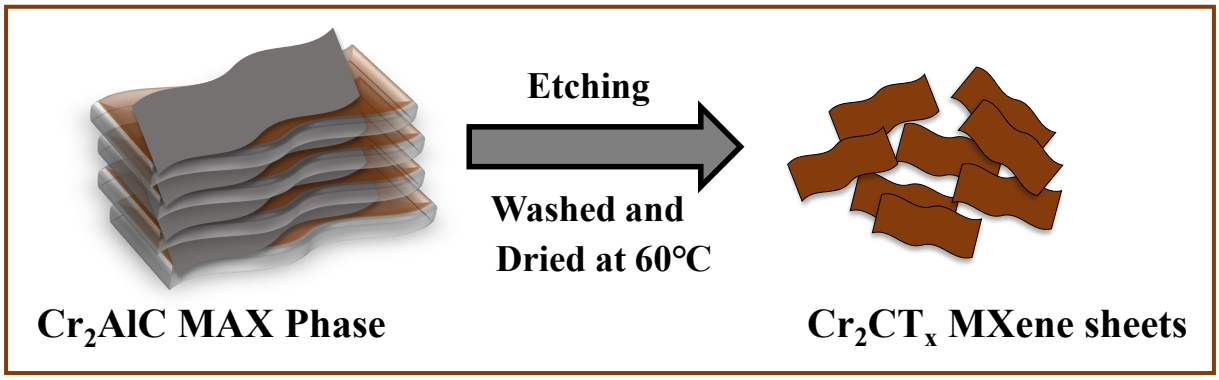

Fig. S1. Schematic illustration of the synthesis of Cr_2CT_x MXene sheets

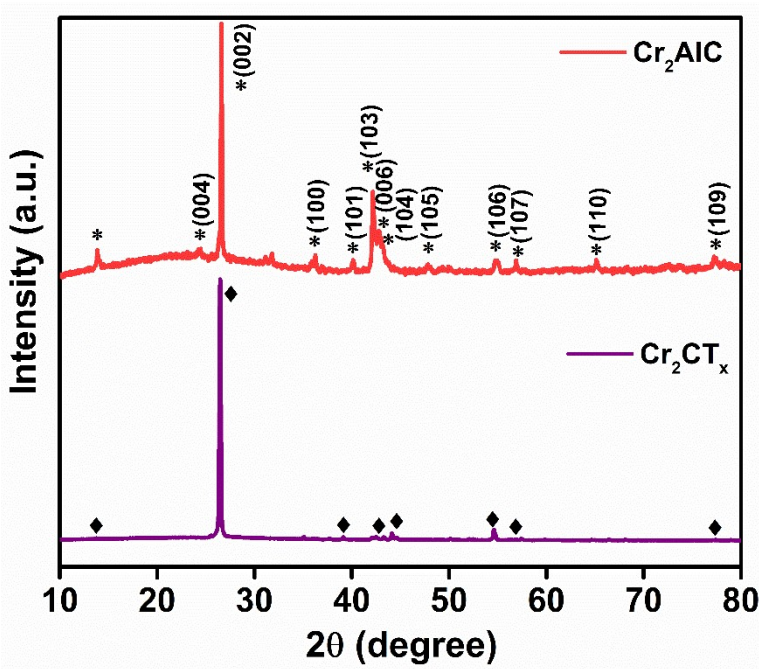

Fig. S2. XRD of Cr_2AlC MAX Phase and Cr_2CT_x MXene

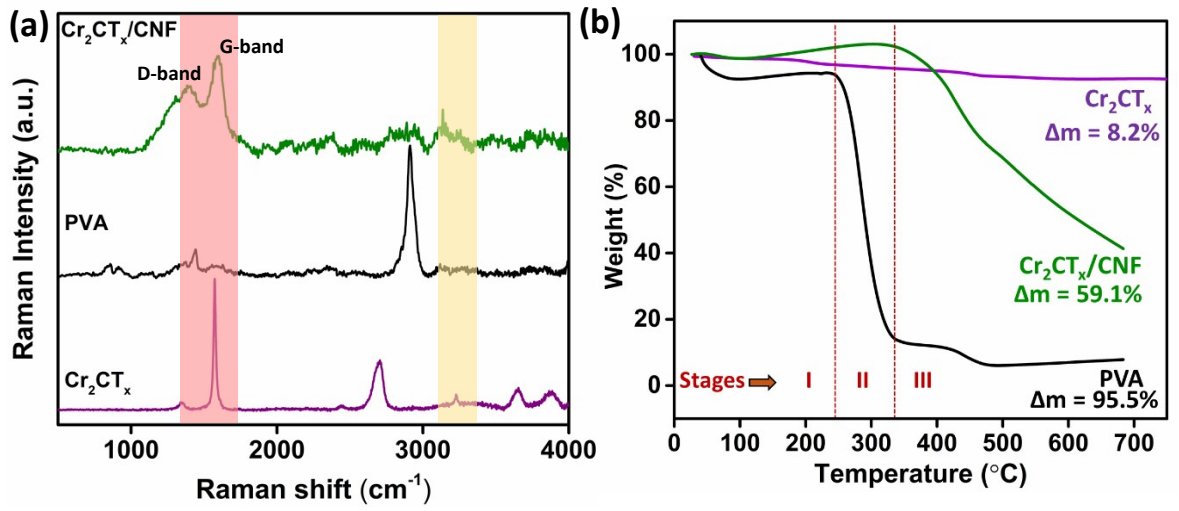

Fig. S3. (a) Raman spectra and (b) TGA profiles of Cr_2CT_x/CNF, PVA, and Cr_2CT_x

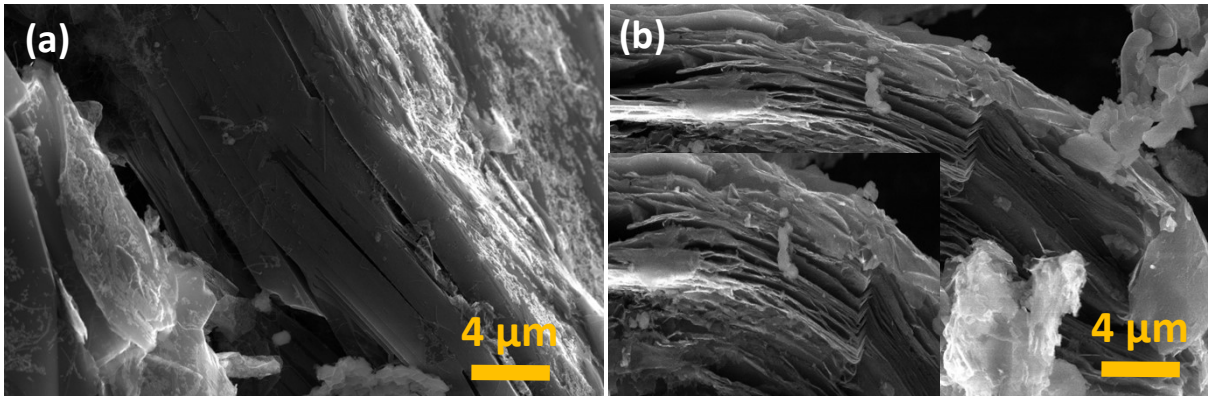

Fig. S4. SEM image of (a) Cr_2AlC MAX Phase (b) Cr_2CT_x MXene

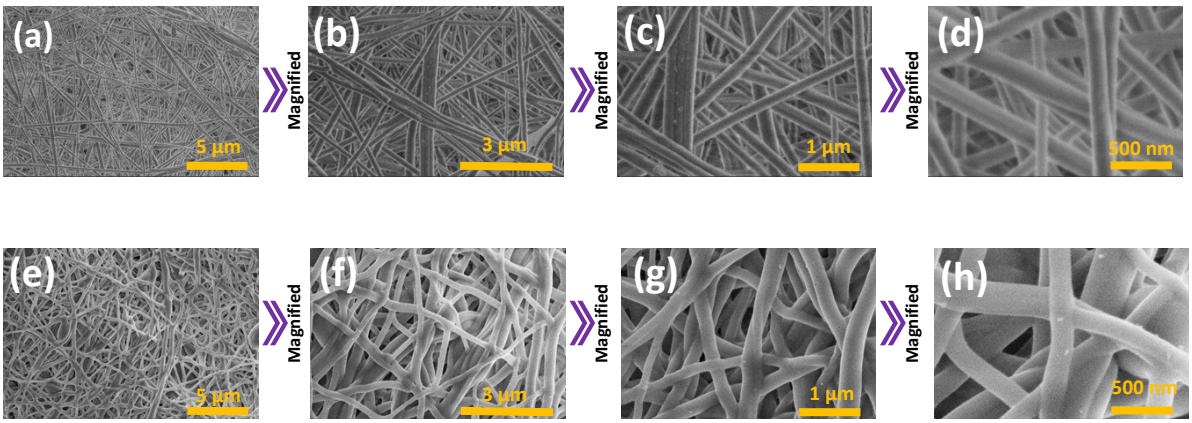

Fig. S5. SEM images of (a-d) Cr_2CT_x/CNF1 and (e-h) Cr_2CT_x/CNF

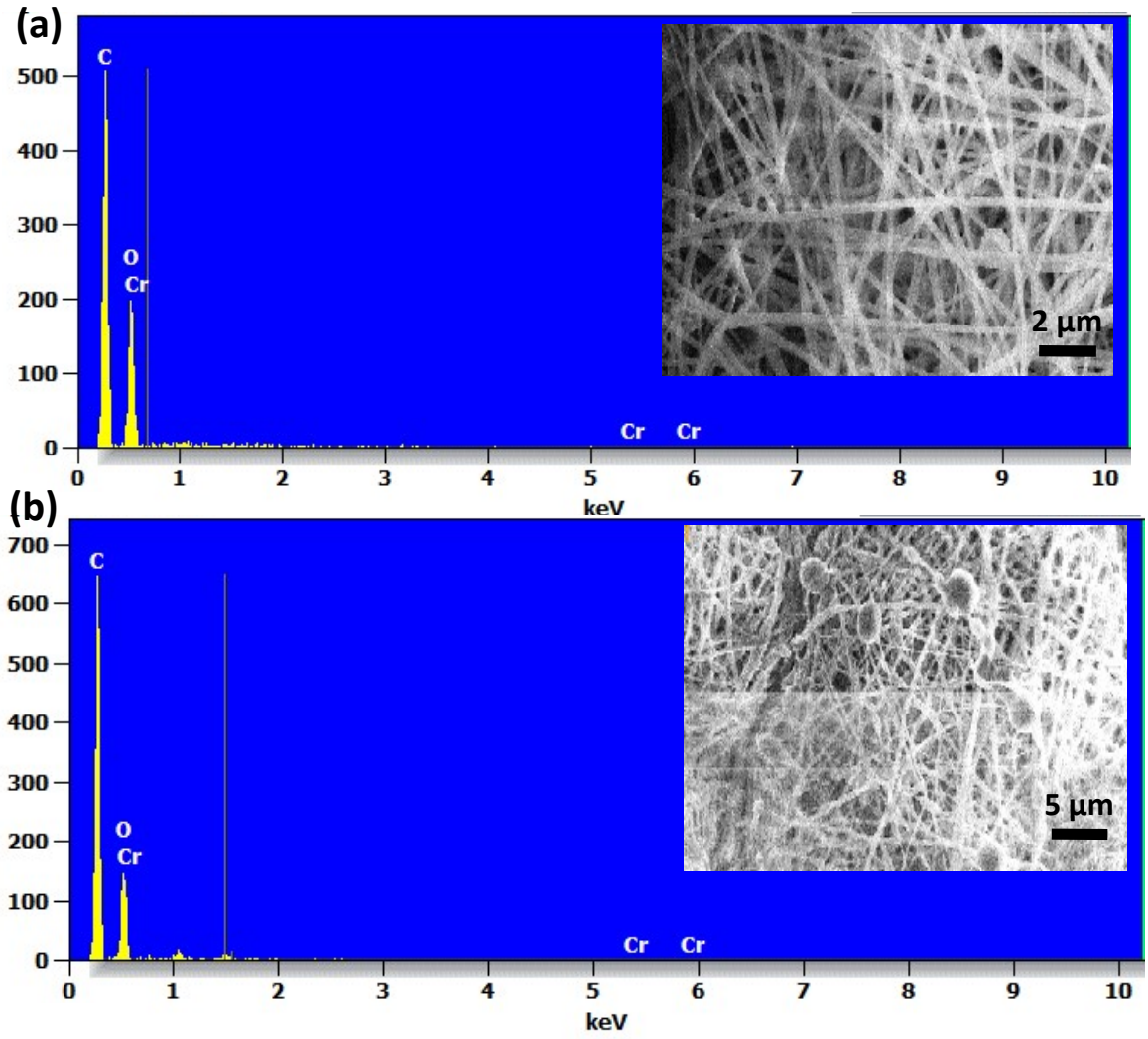

Fig. S6. EDX spectra (inset SEM image) of (a) Cr_2CT_x/CNF1 and (b) Cr_2CT_x/CNF

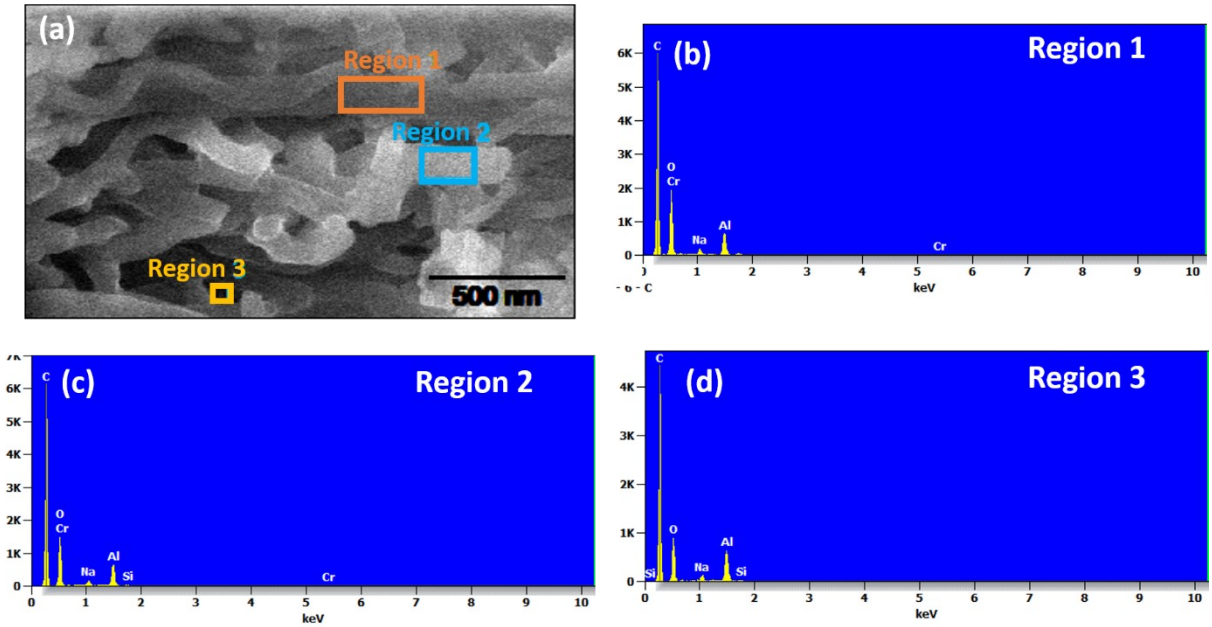

Fig. S7. Cross-sectional SEM images of Cr_2CT_x/CNF with various regions within the fiber matrix (regions 1 and 2) and outside the fiber matrix (region 3), Area EDX spectrum of Cr_2CT_x/CNF analyzed in (a) region 1, (b) region 2 and (c) region 3.

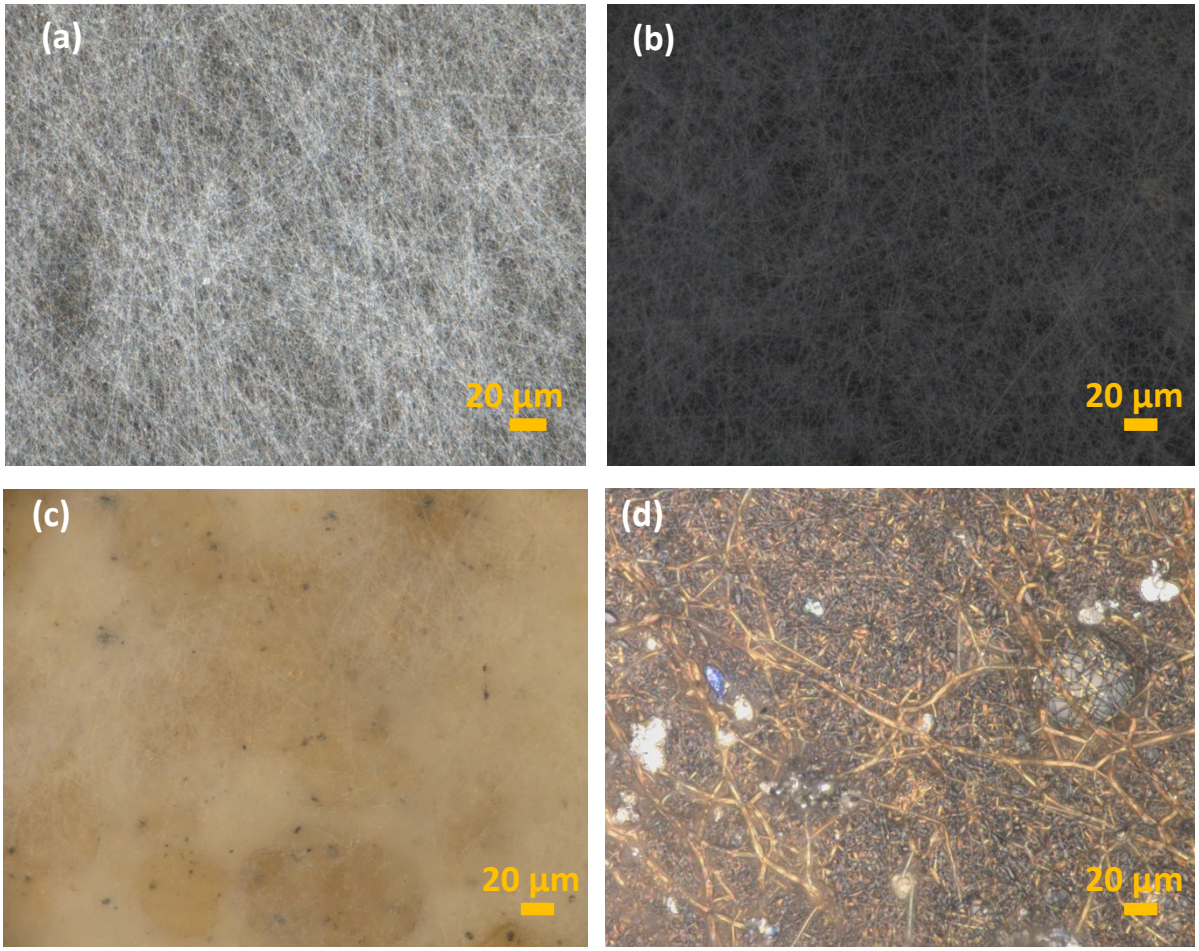

Fig. S8. Optical microscopic images of nanofiber mats of (a) PVA, (b) Cr_2CT_x /PVA, (c) Cr_2CT_x/CNF1 and (d) Cr_2CT_x /CNF

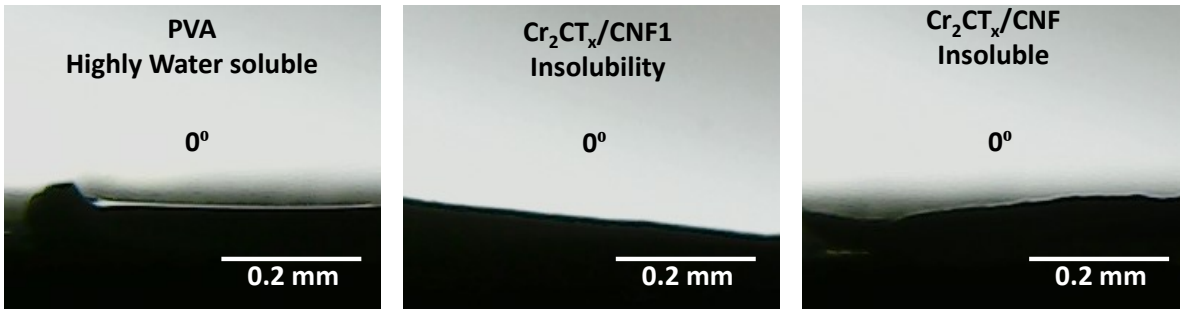

Fig. S9. Surface wettability of nanofiber samples. Magnified photographs of water droplets placed over the fibrous mats are shown in the images.

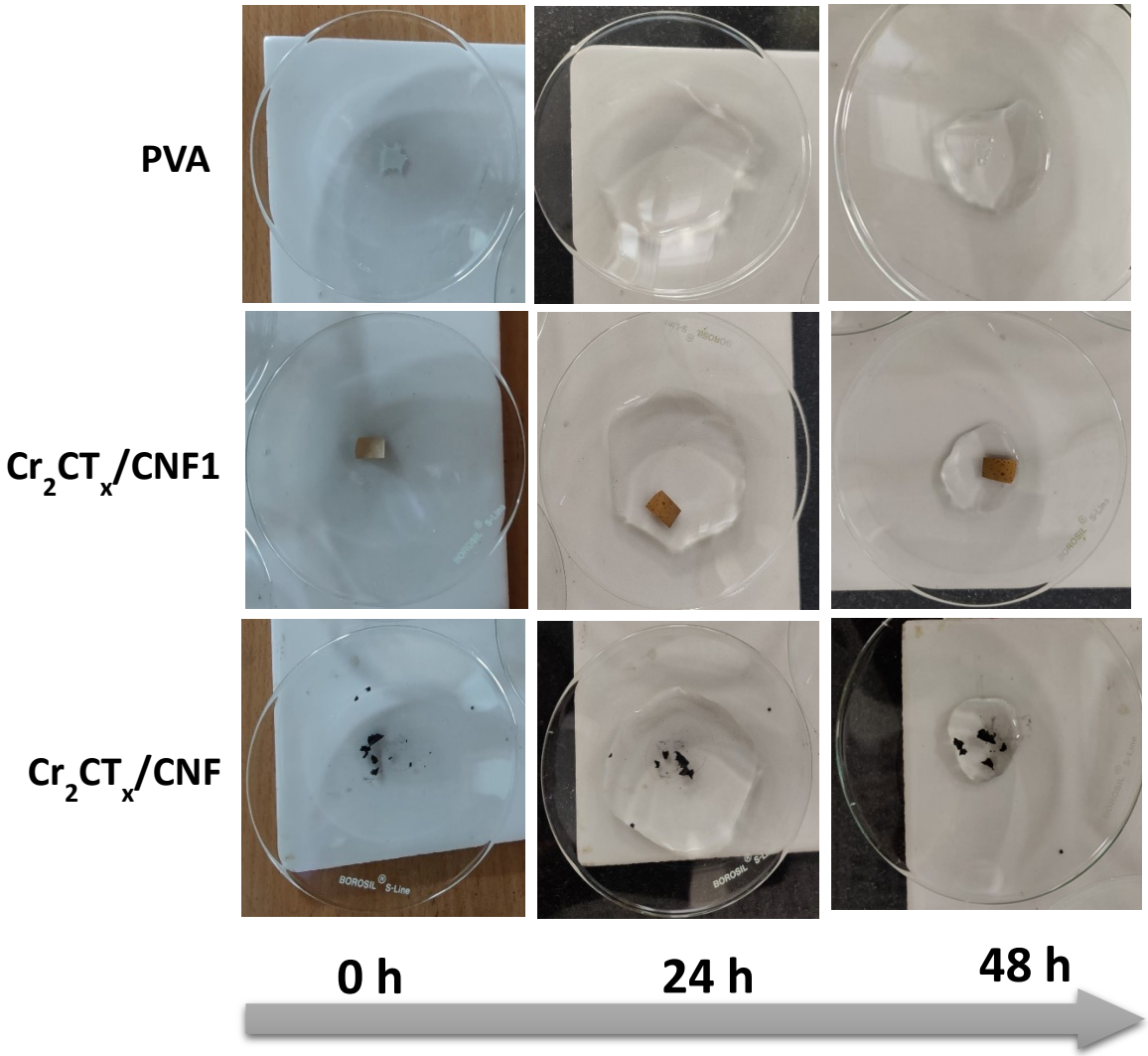

Fig. S10. Photographs showing the water Solubility of PVA, Cr_2CT_x/CNF1 and Cr_2CT_x/CNF with time.

Video S1. Evidence for the insolubility of Cr_2CT_x/CNF compared the PVA nanofibrous mat.

(Uploaded separately)

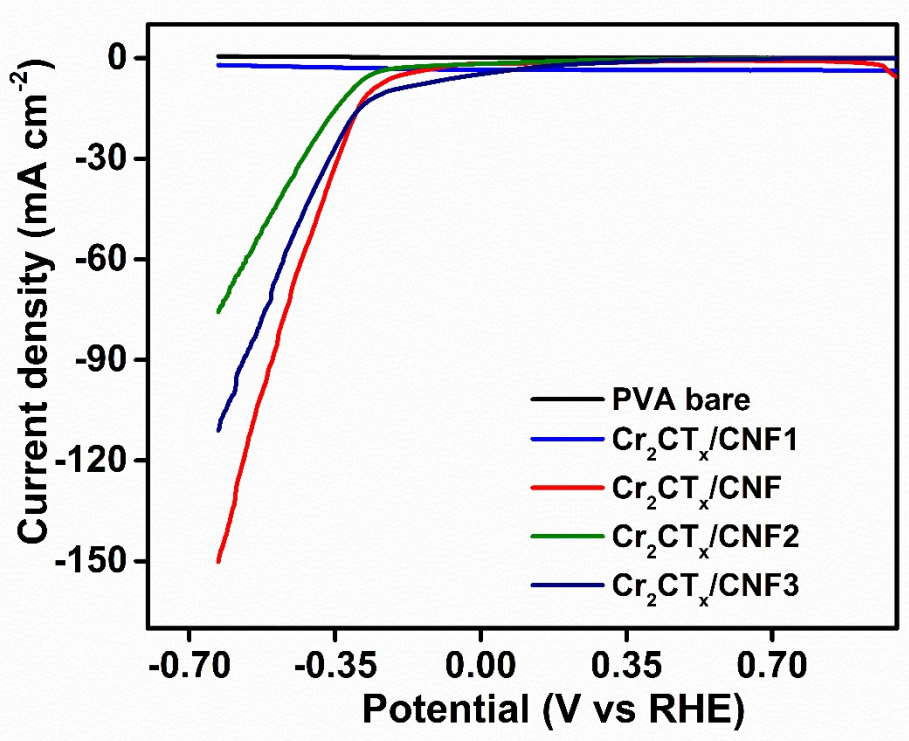

Fig. S11. Comparison of LSV profiles of PVA bare and various Cr_2CT_x/CNF obtained for HER

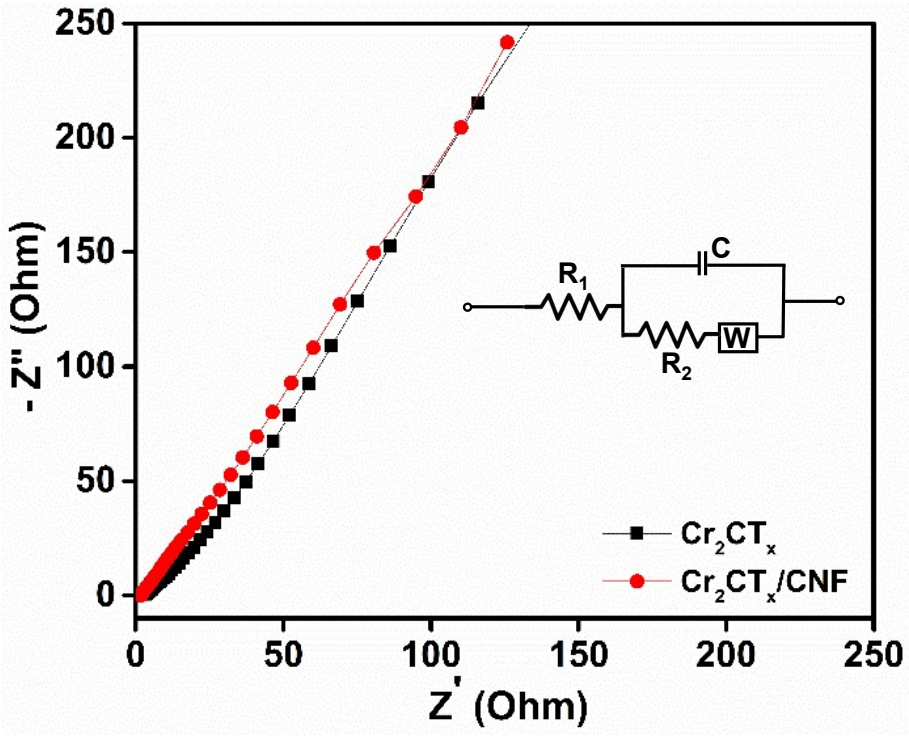

Fig. S12. Nyquist plot with fitted Randles circuit for HER performance

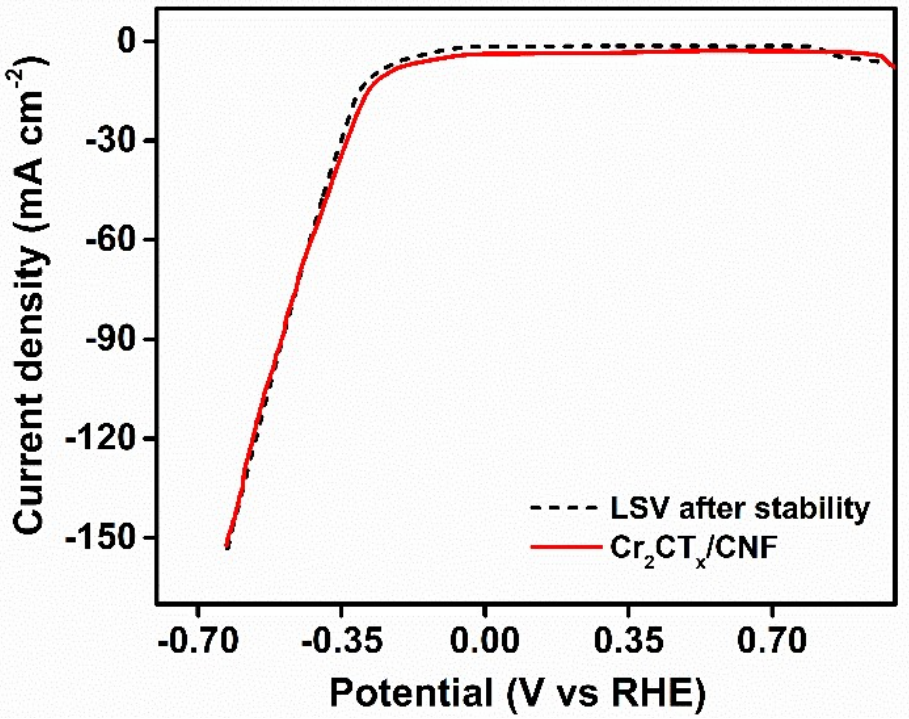

Fig. S13. LSV profile of Cr_2CT_x /CNF before and after stability check for HER

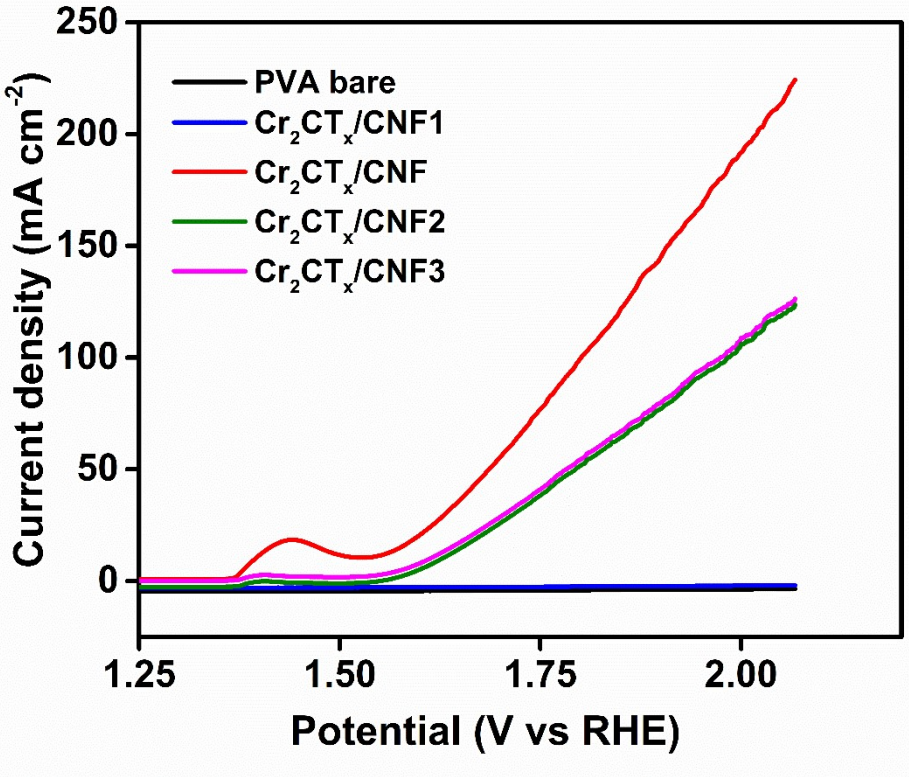

Fig. S14. Comparison of LSV profiles of PVA bare and various Cr_2CT_x/CNF obtained for HER

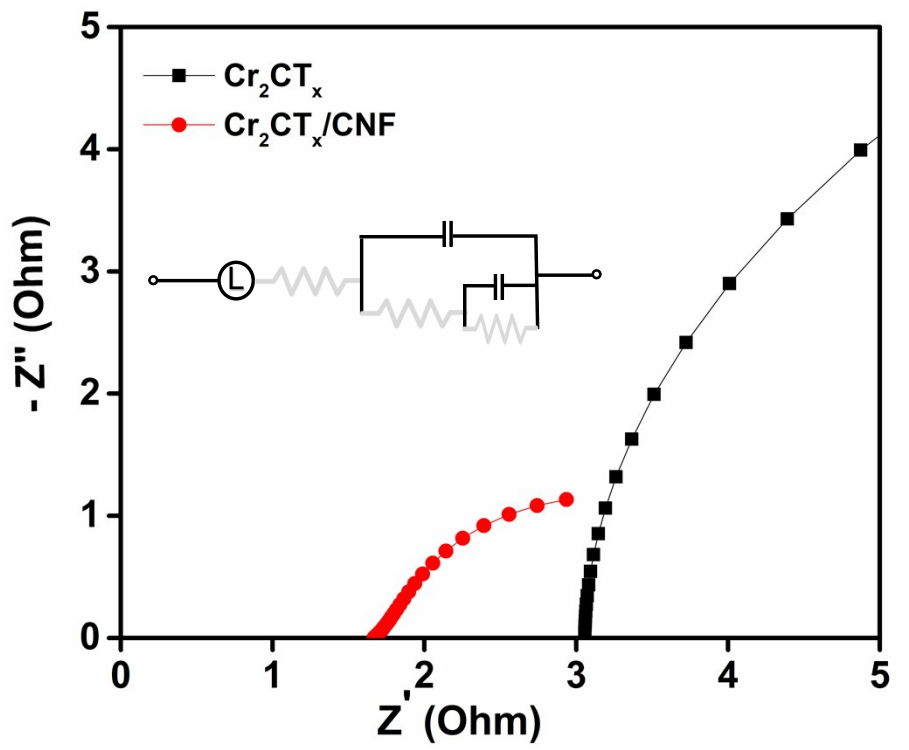

Fig. S15. Nyquist plot fitted Randles circuit for OER performance

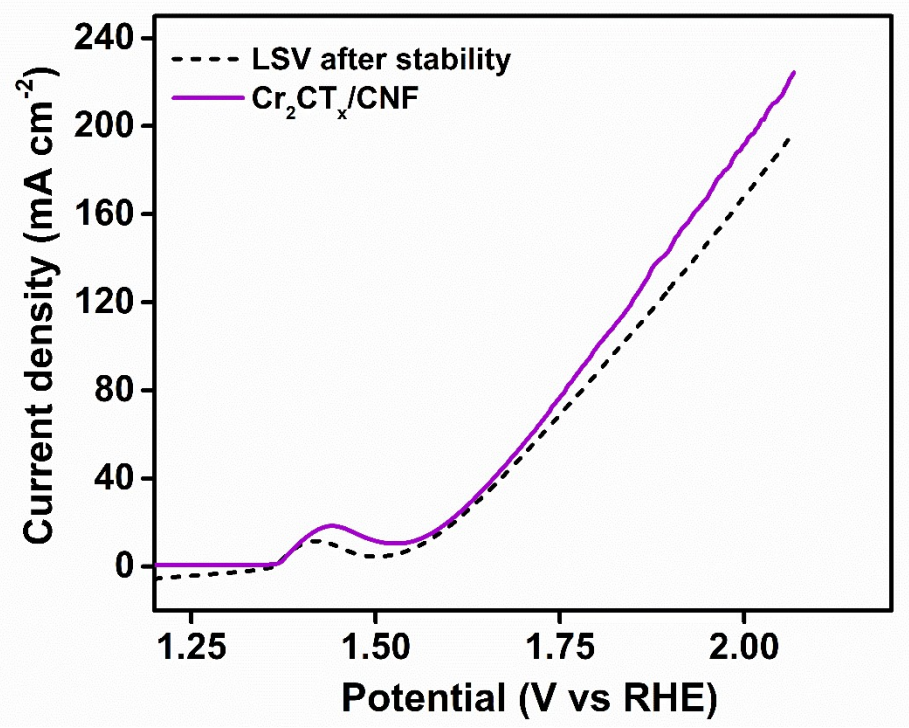

Fig. S16. LSV profile of Cr_2CT_x /CNF before and after stability check for OER

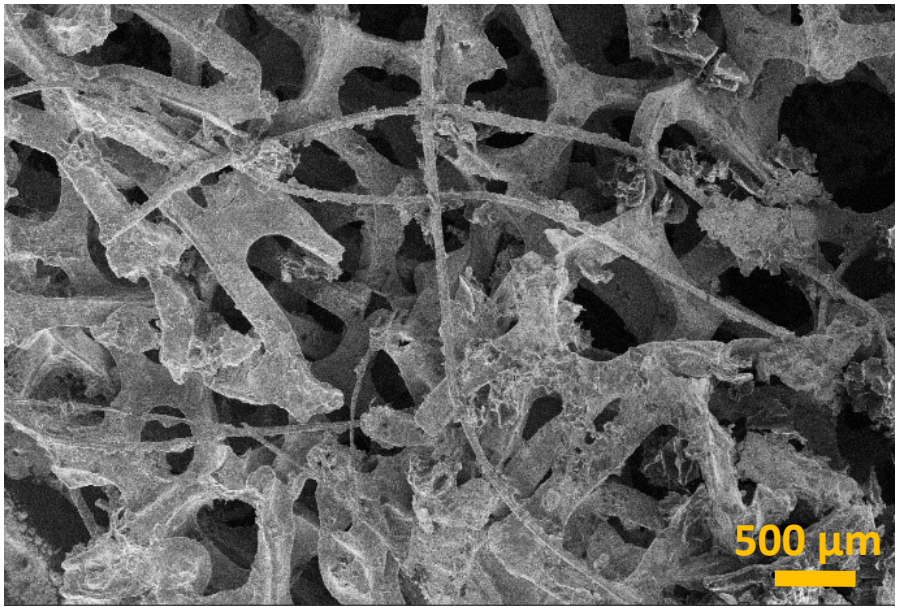

Fig. S17. SEM image of Cr_2CT_x/CNF after bulk electrolysis (stability test)

Table S1. Elemental compositions derived from the EDX analysis of prepared Cr_2CT_x/CNF1 and Cr_2CT_x/CNF

Materials	Element present	Weight %	Atom %	Atom % Error
Cr_2CT_x/CNF1	C	43.21	51.91	±0.74
	O	51.79	46.71	±1.04
	Cr	4.99	1.39	±0.33
Cr_2CT_x/CNF	C	50.03	57.20	±0.71
	O	49.83	42.76	±1.05
	Cr	0.14	0.04	±0.07

Table S2. The weight and atomic percentage of elements present in the Cr_2CT_x/CNF were analyzed in various regions as shown in Fig. S7

Position	Parameter	C	O	Cr	Al	Na	Si
Region 1 (within fiber matrix)	Weight %	56.62	25.98	7.32	8.71	1.36	-
	Atom %	68.71	23.67	2.05	4.71	0.86	-
	Atom % Error	±0.49	±2.51	±0.22	±0.12	±0.11	-
Region 2 (within fiber matrix)	Weight %	57.34	26.97	3.73	9.48	2.20	0.28
	Atom %	68.31	24.12	1.03	5.03	1.37	0.14
	Atom % Error	±0.41	±1.73	±0.11	±0.07	±0.08	±0.03
Region 3 (outside fiber matrix)	Weight %	53.20	33.41	-	11.50	1.89	-
	Atom %	63.04	29.72	-	6.06	1.17	-
	Atom % Error	±0.41	±0.47	-	±0.10	±0.08	-

Table S3. Comparison of HER, OER and OWS activity with reported literature.

Electrocatalyst	Polymer and Synthesis approach	Reference electrode	Water splitting activity @10 mV cm^{-2}	Ref.
Sn/Mo_2C/CNF	PAN/DMF solution Electrospinning	Hg/HgO	144 mV -HER	[1]
Co_3W_3C/CoP/N,P-Carbon fibers	PAN/DMF Electrospinning	-	139 mV -HER 200 mV - OER	[2]
S,N-CNF/Co-NiO	PAN/DMF Electrospinning	Hg/HgO	169 mV - HER 247 mV - OER	[3]
NiCo/CNF/N-dopped carbon shell	Polydopamine Electrospinning	Hg/HgO	220 mV - HER 0.40 V - OER	[4]
Cr_2CT_x/CNF	**PVA Electrospinning**	**SCE**	**265 mV - HER 250 mV - OER**	**Present work**

References

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3 S. Surendran, S. C. Jesudass, G. Janani, J. Y. Kim, Y. Lim, J. Park, M. Han, I. S. Cho and U. Sim, *Adv. Mater. Technol.*, , DOI:10.1002/admt.202200572.

4 T. T. Gebremariam, F. Chen, Y. Jin, Q. Wang, J. Wang and J. Wang, *Catal. Sci. Technol.*, 2019, **9**, 2532–2542.