

Supplementary Information

Structural design of asymmetric gradient alternating multilayered CNF/MXene/FeCo@rGO composite films for efficient and enhanced absorbing electromagnetic interference shielding

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Table S1 Composition and content of each layer of CNF/MXene/FeCo@rGO composite films

Sample	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
20 wt%-1L	18 mL CNF 9 mL MXene 18 mL FeCo@rGO					
20 wt%-2L	9 mL CNF 9 mL MXene	9 mL CNF 18 mL FeCo@rGO				
20 wt%-4L	1.5mL CNF 6 mL MXene	9 mL CNF 6 mL FeCo@rGO	4.5mL CNF 3 mL MXene	3 mL CNF 12 mL FeCo@rGO		
20 wt%-6L (CNF/MXene/FeCo@rGO-G)	5 mL MXene	8 mL CNF 2 mL FeCo@rGO	2 mL CNF 3 mL MXene	4 mL CNF 6 mL FeCo@rGO	4 mL CNF 1 mL MXene	10 mL FeCo@rGO

CNF/ MXene	5 mL MXene	10 mL CNF	2 mL CNF 3 mL MXene	10 mL CNF	4 mL CNF 1 mL MXene	10 mL CNF
CNF/ MXene/ FeCo@rG O-H	5 mL MXene	4 mL CNF 6 mL FeCo@rGO	2 mL CNF 3 mL MXene	4 mL CNF 6 mL FeCo@rGO	4 mL CNF 1 mL MXene	4 mL CNF 6 mL FeCo@rGO

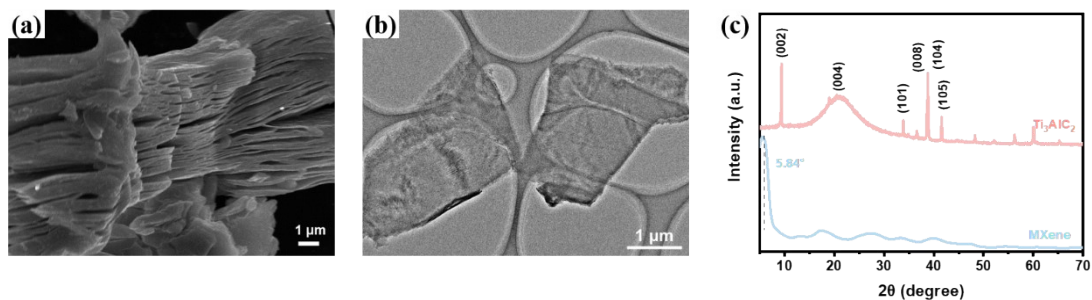


Fig. S1 (a) SEM image and (b) TEM image of d-MXene; (c) XRD of Ti_3AlC_2 and $Ti_3C_2T_x$

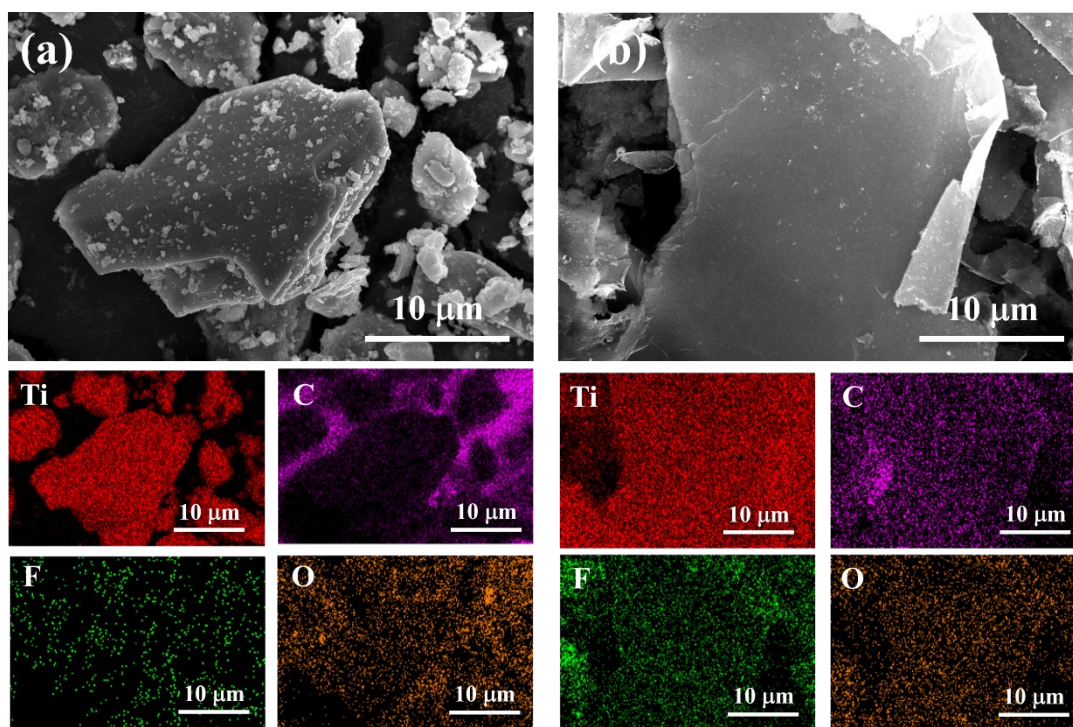


Fig. S2 SEM images of fracture surface of (a) Ti_3AlC_2 (b) $Ti_3C_2T_x$ MXene and corresponding EDS mappings of Ti, C, F and O elements

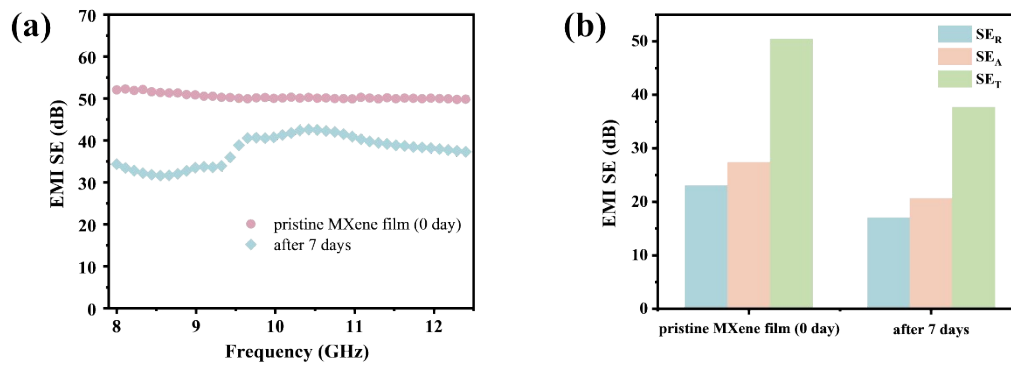


Fig. S3 (a) EMI SE (b) SE_R, SE_A and SE_T of pristine MXene film and after 7 days

Table S2 Comparison of properties of CNF/MXene/FeCo@rGO asymmetric gradient alternating multilayered composite membranes with those reported in the literature

Samples	Filler	thickness (mm)	EMI SE (dB)	R
MXene/CNF ¹	MXene	0.035	39.6	0.96
CNT/PP ²	CNT	2.0	32.0	0.75
Graphene/CNF ³	Graphene	0.04	34.9	0.9
MXene/PVDF ⁴	MXene	0.017	42.9	0.9
GNP-Ni-CNT/PVDF ⁵	GNP-Ni-CNT	0.6	46.0	0.8
MXene/EP ⁶	MXene	2.0	41.0	0.75
This Work	FeCo@rGO&MXene	0.192	45.20	0.71

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