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Supporting Information

Ultrastrong and highly conductive MXene/cellulose nanofiber films with hierarchical nano-architecture for flexible high-performance electromagnetic interference shielding

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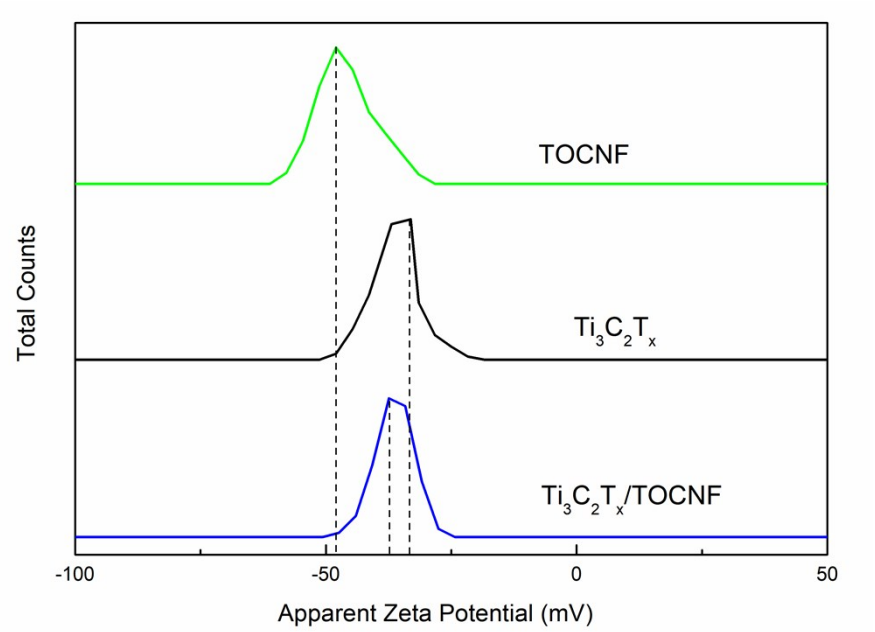

Figure S1 - Zeta potential patterns of TOCNF, $Ti_3C_2T_x$ and $Ti_3C_2T_x$/TOCNF suspensions. The Zeta Potential peats of TOCNF, $Ti_3C_2T_x$ and $Ti_3C_2T_x$/TOCNF are -45.9 mV, -33.0 mV, -36.4 mV, respectively.

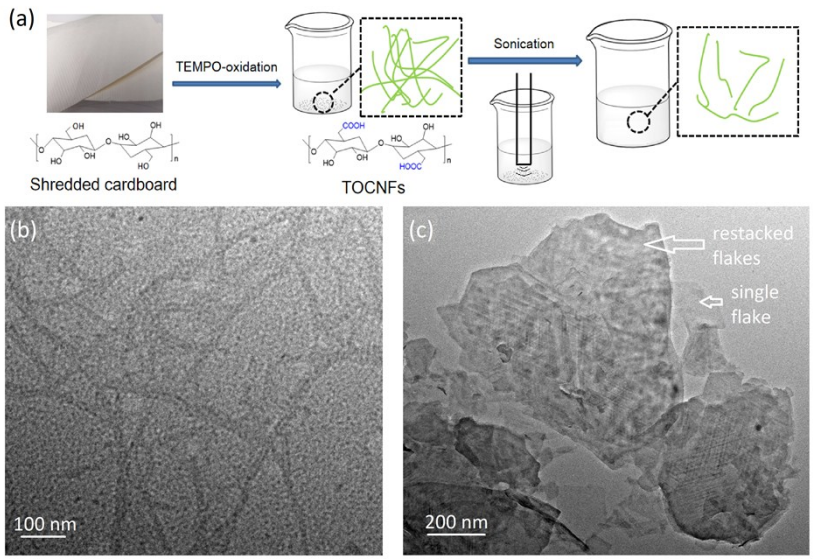

Figure S2 - (a) Schematic illustration of the synthesis procedure of the TOCNFs. (b) The TEM images of TOCNFs. (c) TEM image of as-prepared $Ti_3C_2T_x$ nanoflakes.

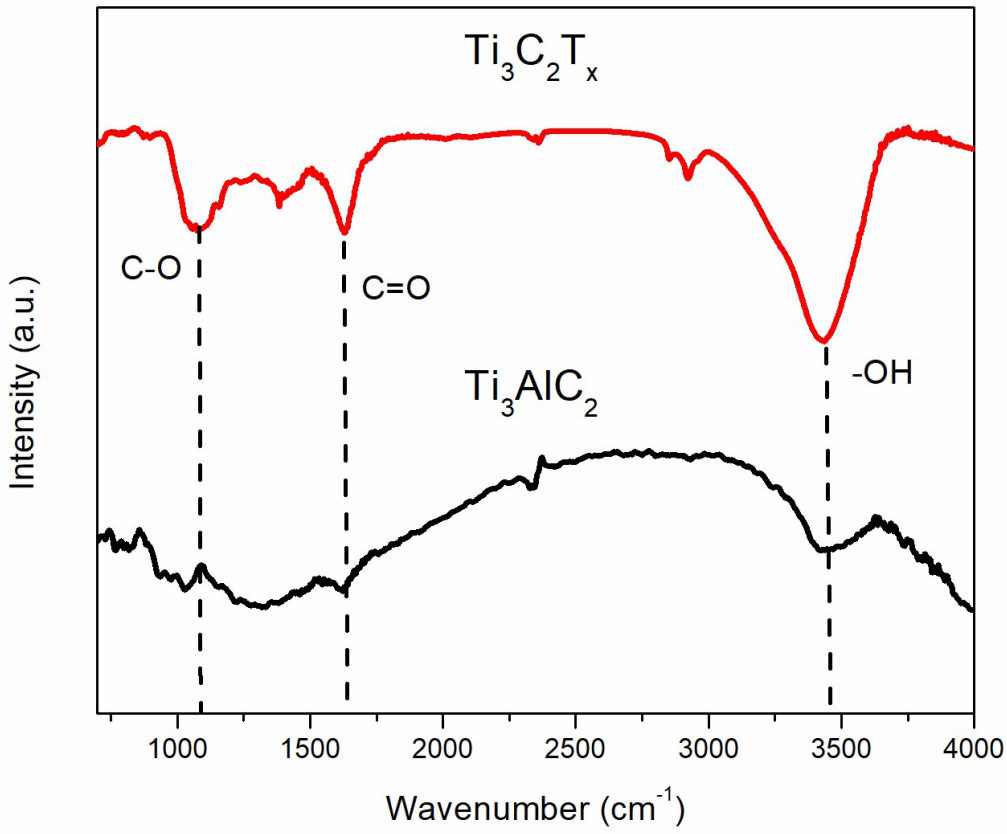

Figure S3 - FTIR spectra of Ti_3AlC_2 and $Ti_3C_2T_x$. It is clear that extensive oxygen-containing functional gourps were deposited after etching.

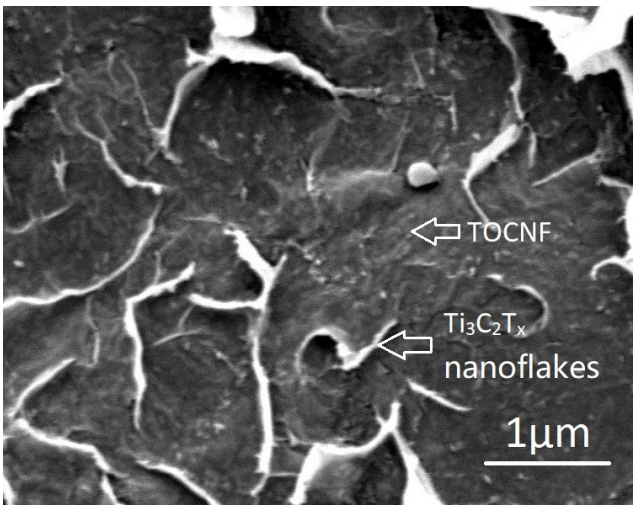

Figure S4 - SEM image of the surface of $Ti_3C_2T_x$/TOCNF composite paper.

Table S1. Mechanical properties of $Ti_3C_2T_x$, TOCNF and $Ti_3C_2T_x$/TOCNF composite paper.

$Ti_3C_2T_x$ content (wt%)	**Thickness (μm)**	**Young's modulus (GPa)**	**Tensile strength (MPa)**	**Strain of failure (%)**	**Toughness (MJ/m^3)**
100	16	1.9	12.8	0.7	0.1
50	38	7.0	141.9	2.1	1.7
40	35	5.9	212.2	4.3	5.5
30	33	6.2	196.1	3.6	4.1
20	31	6.1	177.8	3.2	3.4
10	27	5.5	171.5	5.3	6.1
0	28	5.8	171.1	8.0	10.1

Table S2. Comparison of the mechanical properties of different flexible supercapacitor paper electrodes with $Ti_3C_2T_x$/CNF composite paper.

Flexible electrodes	Young's modulus (%)	Tensile strength (MPa)	References
PAni/BC	2.7	16	1
GO/BC	1.7	242	2
RGO/CNF/RGO	4.8	91	3
Ammonia-functionalized GO/CNF	2.9	82	4
Ammonia-functionalized GO/TOCNF	3.4	88	4
$Ti_3C_2T_x$/PVA	3.7	91	5
$Ti_3C_2T_x$/PBI	0.9	30	6
$Ti_3C_2T_x$/BC	0.6	43	7
$Ti_3C_2T_x$/UHMWPE	7.5	39	8
$Ti_3C_2T_x$	1.9	12.8	This work
$Ti_3C_2T_x$/TOCNF	7.0	212	This work

Table S3. Electrical properties of $Ti_3C_2T_x$, TOCNF and $Ti_3C_2T_x$/TOCNF composite paper.

$Ti_3C_2T_x$ content (wt%)	**Thickness (μm)**	**Conductivity (S/m)**
100	16	4432
50	38	2837
40	35	1212
30	33	30.4
20	31	2.1
10	27	0.3
0	28	0

Table S4. Comparison of EMI shielding performance of the $Ti_3C_2T_x$/TOCNF composite films versus other materials.

Sample	**Thickness (μm)**	**SE (dB)**	**SSE/t, (dB cm^2 g^{-1})**	**Reference**
Carbon foam	200	~40	1250	9
CNT sponge	240	~20	4622	10
CNF mat	290	~52.2	1362	11
CNT/Graphene	1000	26-28	2143	12
CNTs/PC	2100	~39	164	13
MWCNTs/PS	2000	~30	285	14
SWCNTs/PS	1200	~18.5	275	15
Graphene/PS	2000	~29	258	16
Graphene/PMMA	2400	~19	100	17
Graphene/PI	800	17-21	848	18
	47	24	2647	
$Ti_3C_2T_x$/ CNF	74	26	2154	19
	167	25	1326	
$Ti_3C_2T_x$/ TOCNF-50	47	~32.7	4761	This work

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