Supplementary Materials

Improved Mechanical Strength of Dicatechol Crosslinked MXene Films for Electromagnetic Interference Shielding Performance

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The EMI shielding performance was measured by using a vector network analyzer (E5063A ENA, Keysight Technologies, USA) with an airline kit (85051BR03) in the frequency range of 2−18 GHz based on the coaxial method. The samples were cut into a rectangular shape (with inner and outer diameters of 2 and 3 mm, respectively). The samples were sandwiched between two rectangular sample flanges. The scattering parameters (S_{11} and S_{21}) were collected to calculate the coefficients of reflection (R) and absorption (A). Finally, the shielding effectiveness of reflection (SE_R), absorption (SE_A) and total shielding effectiveness (SE_T) were determined using the following equations:

$$R = |S_{11}|^2 \quad (1)$$

$$T = |S_{21}|^2 \quad (2)$$

$$A = 1 - R - T \quad (3)$$

$$SE_R = -10\ \log_{10}(1 - R) \quad (4)$$

$$SE_A = -10\ \log_{10}[T/(1 - R)] \quad (5)$$

$$SE_T = -10\ \log_{10}(T) \quad (6)$$

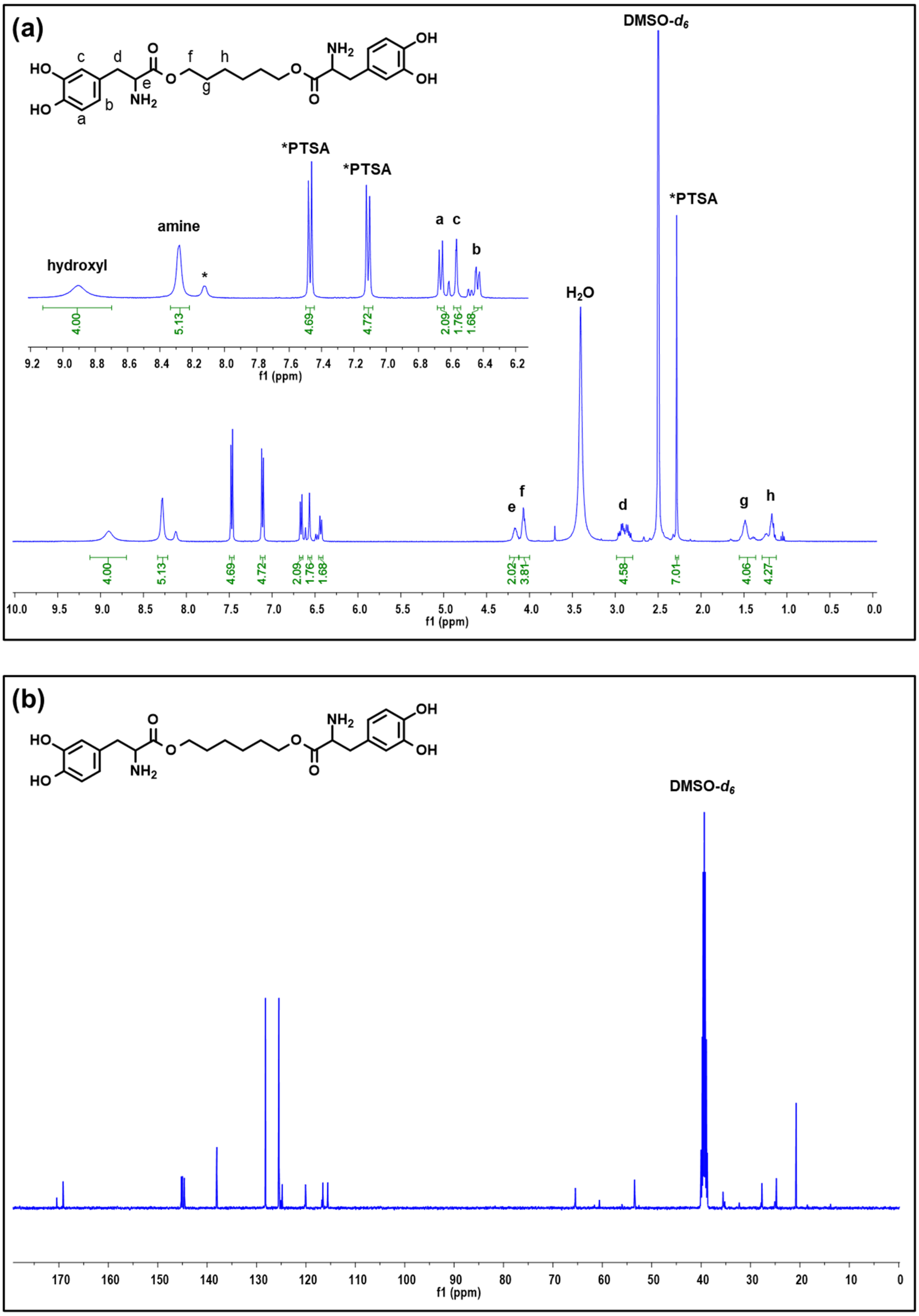
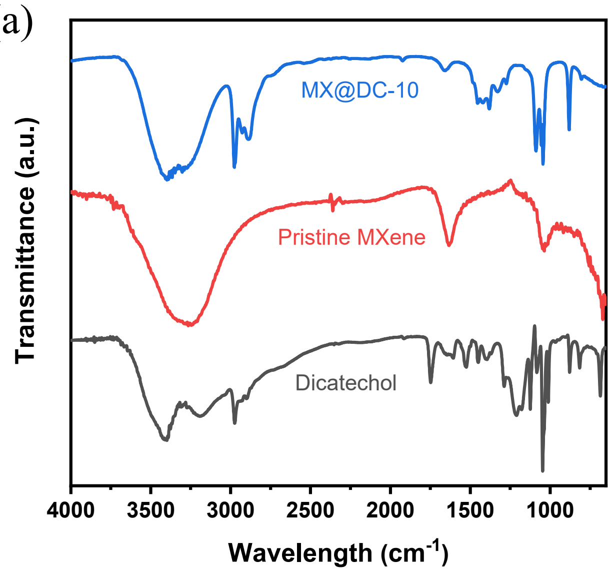


Figure S1. (a) ^{1}H−NMR and (b) ^{13}C−NMR spectra of the synthesized DC in DMSO−d_6. The asterisk means the residual chloroform and PTSA.

(a)



(b)

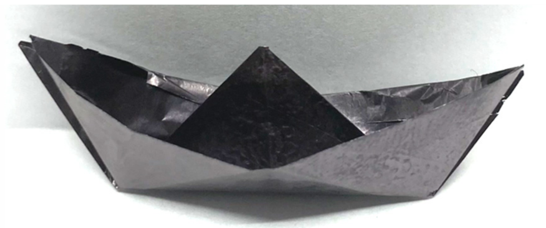


Figure S2. (a) FT−IR spectra of DC, pristine MXene and MX@DC−10 films, and (b) Digital photograph of the MX@DC−5 film which was shaped into a boat.

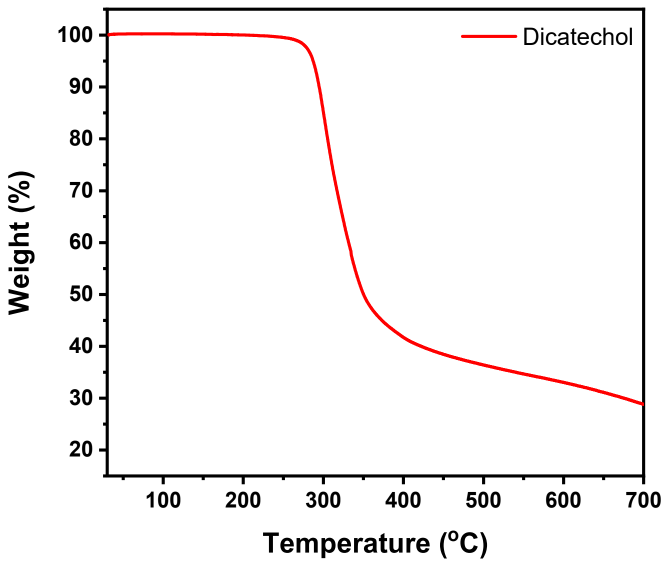


Figure S3. TGA curve of the synthesized DC.

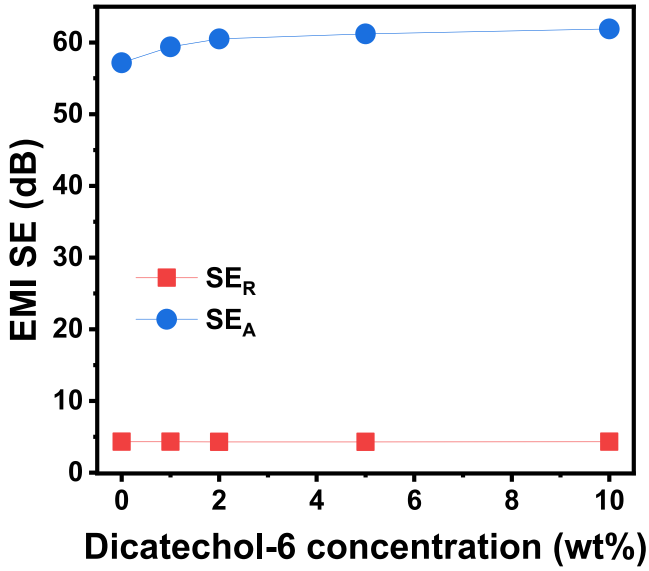


Figure S4. EMI SE of reflection (SE_R) and absorption (SE_A) of the MX@DC−x films as a function of DC concentration.

Table S1. EDS of MAX and MXene.

Element	wt%	
	MAX	**Mxene**
Ti	60.18	52.47
Al	14.92	0.19
C	15.25	19.46
O	9.65	18.9
F	-	6.18
Cl	-	2.8

Table S2. I_D/I_G ratio of MXene and MX@DC−*x* films.

Films	I_D/I_G
Pristine MXene	0.931
MX@DC-1	0.936
MX@DC-2	0.928
MX@DC-5	0.923
MX@DC-10	0.892

Table S3. A summary on tensile and strain of the pure and functionalized $Ti_3C_2T_x$ (MXene) films.

Films	**Stress (MPa)**	**Strain (%)**	**Ref.**
Pure $Ti_3C_2T_x$	22	1	Ling *et al.*[53]
Pure $Ti_3C_2T_x$	28.7	2.2	Liu *et al.*[54]
Pure $Ti_3C_2T_x$	17.4	6.2	Zhou *et al.*[41]
PANI@ $Ti_3C_2T_x$	33.2	4	Zhou *et al.*[55]
PEDOT-PSS@ $Ti_3C_2T_x$	38.5	0.28	Wan *et al.*[56]
PEDOT-PSS@ $Ti_3C_2T_x$	30	1.5	Liu *et al.*[29]
Pure $Ti_3C_2T_x$	37	3.5	Wan *et al.*[28]
Heated $Ti_3C_2T_x$	32	0.24	Zhao *et al.*[57]
DC@$Ti_3C_2T_x$	39.2	2.2	This work

Table S4. A summary on EMI SE of the pure and functionalized $Ti_3C_2T_x$ (MXene) films.

Films	EMI SE (dB)	Thickness (μm)	Ref.
$Ti_3C_2T_x$/PEDOT:PSS	42.1	11.1	Liu *et al.*[29]
$Ti_3C_2T_x$/AgNW	42.7	16.9	Miao *et al.*[58]
$Ti_3C_2T_x$/CA Aerogel	54.3	26	Zhou *et al.*[59]
$Ti_3C_2T_x$/MMT	65	25	Li *et al.*[60]
$Ti_3C_2T_x$/c-PANI	36	40	Zhang *et al.*[61]
PEDOT:PSS-$Ti_3C_2T_x$	41	60	Bora *et al.*[62]
$Ti_3C_2T_x$/CNF	24	47	Cao *et al.*[40]
DC@$Ti_3C_2T_x$	66.2	15	This work