Supporting Information for

A Healable and Mechanically Enhanced Composite with Segregated Conductive Network Structure for High-Efficient Electromagnetic Interference Shielding

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S1 Synthesis of the CPA

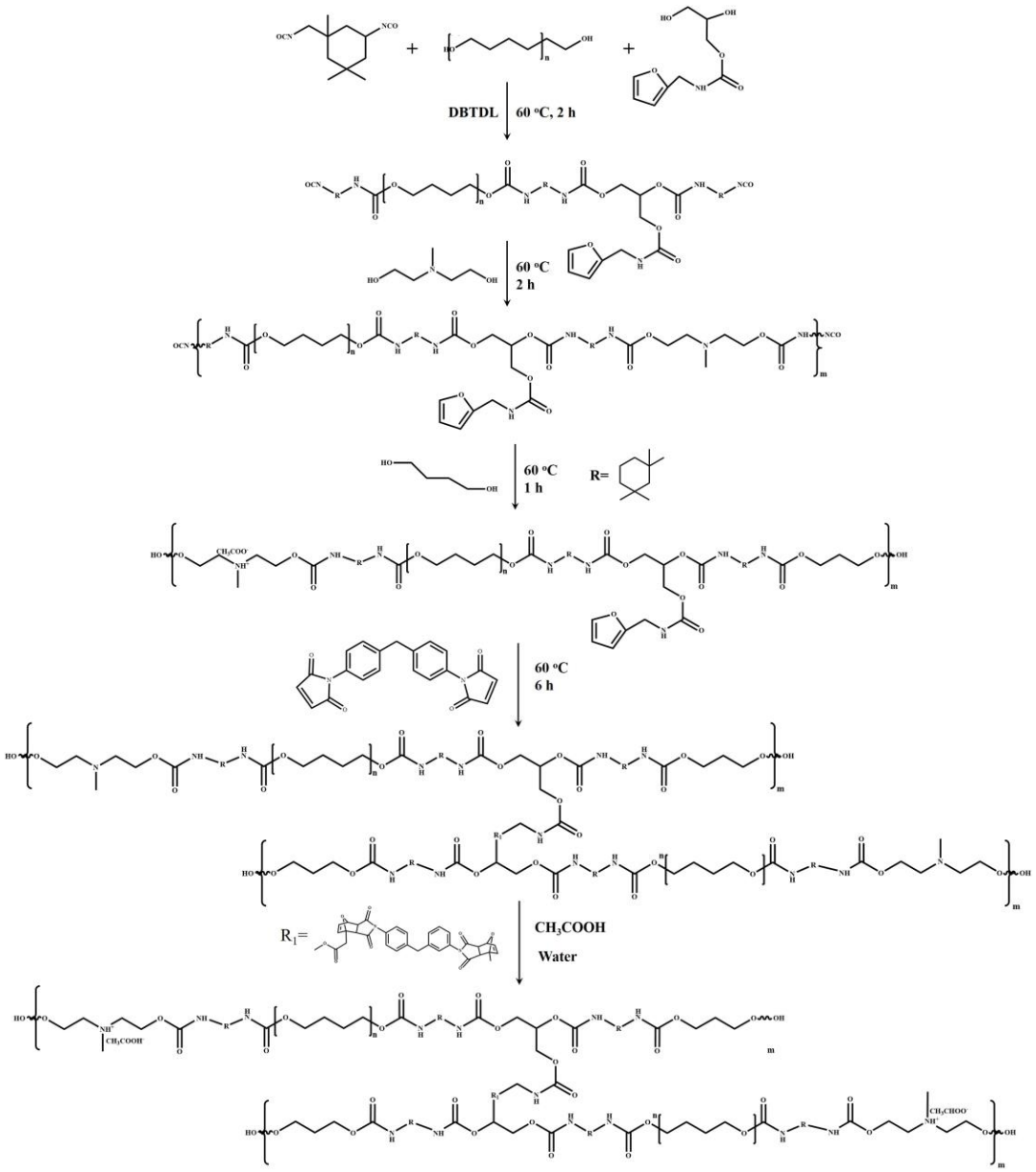

Fig. S1 Synthesis of CPA emulsions

S2 Calculation of EMI SE

EMI SE (SE_T), SE_R, and SE_A was obtained by the recorded scattering parameters (S_{11} and S_{21}). Then reflected power (R), transmitted power (T), and absorbed power (A), EMI SE (SE_T), microwave reflection (SE_R), and microwave absorption (SE_A) were calculated using the equations as follows.

$$R = |S_{11}|^2 \qquad \text{(S1)}$$

$$T = |S_{21}|^2 \quad \text{(S2)}$$

$$A = 1 - R - T \quad \text{(S3)}$$

$$SE_R = -10\lg(1-R) \quad \text{(S4)}$$

$$SE_A = -10\lg\left(\frac{T}{1-R}\right) \quad \text{(S5)}$$

$$SE_T = SE_R + SE_A + SE_M \quad \text{(S6)}$$

When EMI SE is higher than 10 dB, microwave multiple internal reflections (SE_M) are neglectable [S1, S2].

S3 FTIR Characterization of the CPA

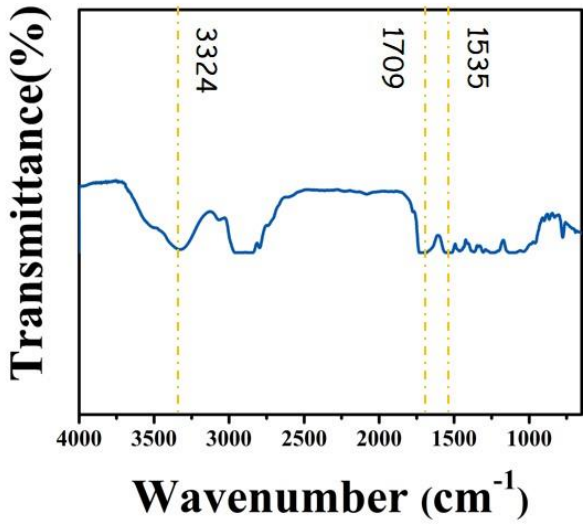

Fig. S2 FTIR spectra of CPA

The peaks at 3324 and 1535 cm^{-1} related to the urethane N-H stretching and deformation vibration, respectively. The characteristic peak at 1709 cm^{-1} is assigned to the C=O of urethane. Besides, the adsorption band of –NCO at 2270 cm^{-1} do not appear, indicating the complete conversion of IPDI to urethane. Furthermore, the weak absorption band at 1772 cm^{-1} corresponds to the DA adducts, manifesting that the DA bond was successfully incorporated into CPA chain. The above special peaks prove the successful synthesis of waterborne polyurethane with DA bond.

S4 Comparison of EMI SE of CG@CPA Composite with the Reported Literature

Table S1 Comparison of EMI SE for our CG@CPA composite with various CNT/polymer composites

Conductive filler	Content (wt%)	Thickness (mm)	EMI SE (dB)	Refs.
CG@CPA	5	2.0	40	this work
CG@CPA	7	2.0	46	this work
CG@CPA	10	2.0	52.7	this work
CNT/PC	10	2.0	36	[S3]
CNT/PS	5	2.0	25.4	[S4]
CNT/PLLA	10	2.5	23	[S5]
CNT/PC	5	2.0	24	[S6]
CNT/PU	10	2.0	13	[S7]
CNT/epoxy	15	2.0	22	[S8]
CNT/PMMA	10	4.5	20	[S9]
CNT/PS	7	1.2	18.5	[S10]
CNT/epoxy	15	1.5	20	[S11]
CNT/PVDF	7	2	30	[S12]

[a]PC, PS, PLLA, PMMA, PVDF are polycarbonate, polystyrene, poly (l-lactic acid), poly (methyl methacrylate), poly (vinylidene fluoride), respectively.

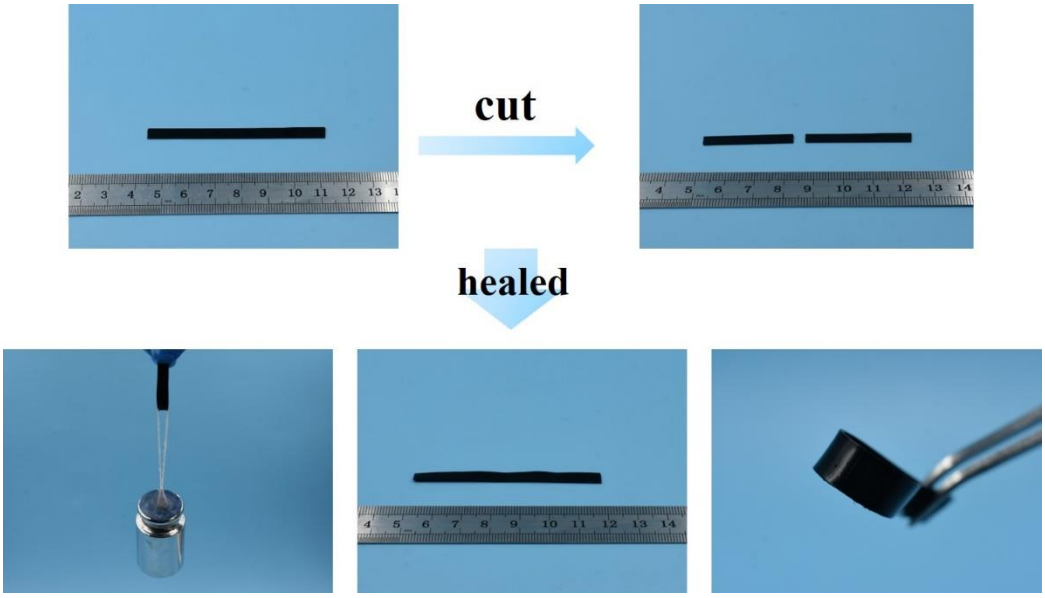

Fig. S3 Digital pictures of the healing process of the CG@CPA-7

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