Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Enhanced Dielectric Performance with High-Temperature Stability by Interface-Modulation of the Core-Shell Structured Imide-Polymer@BT Nanohybrids in PEI-Based Nanocomposites

Jinpeng Li [a], Junhao Jiang [a], Yi Chen [b*], Xiaoyun Liu [a], Peiyuan Zuo [a], Qilin Cheng [a], Qixin Zhuang [a*]

[a] Key Laboratory of Advanced Polymer Materials of Shanghai, School of Material Science and Engineering, East China University of Science and Technology, Shanghai 200237, P.R China

[b] Shanghai Spaceflight Precision Machinery Institute, Shanghai, 201108, P.R China

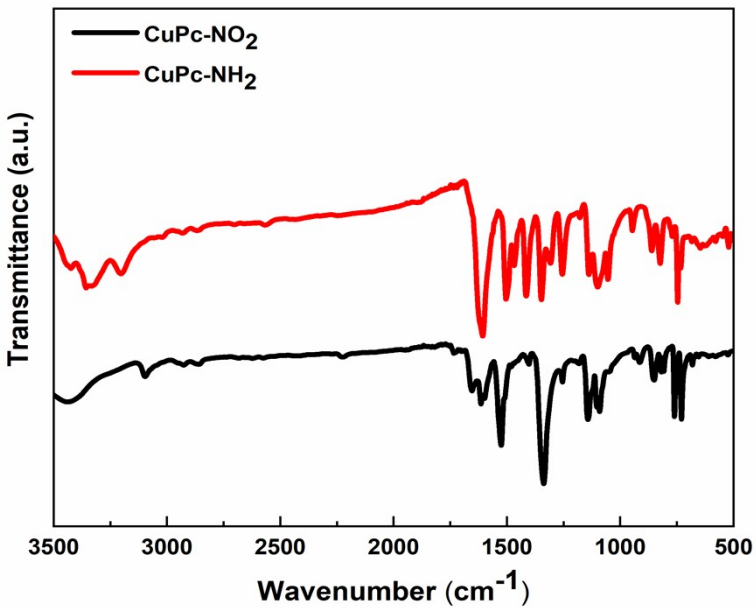

Fig. S1 FTIR spectra of CuPc-NO_2 and CuPc-NH_2

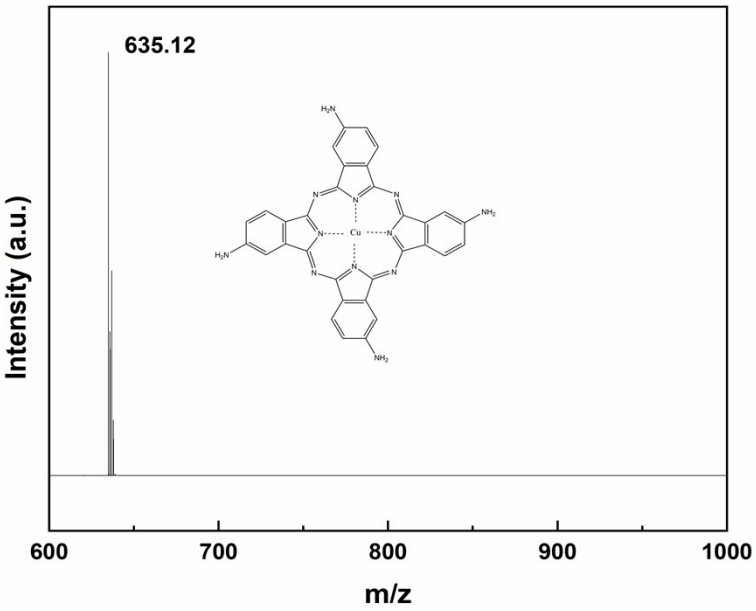

Fig. S2 Mass spectrometry of CuPc-NH_2

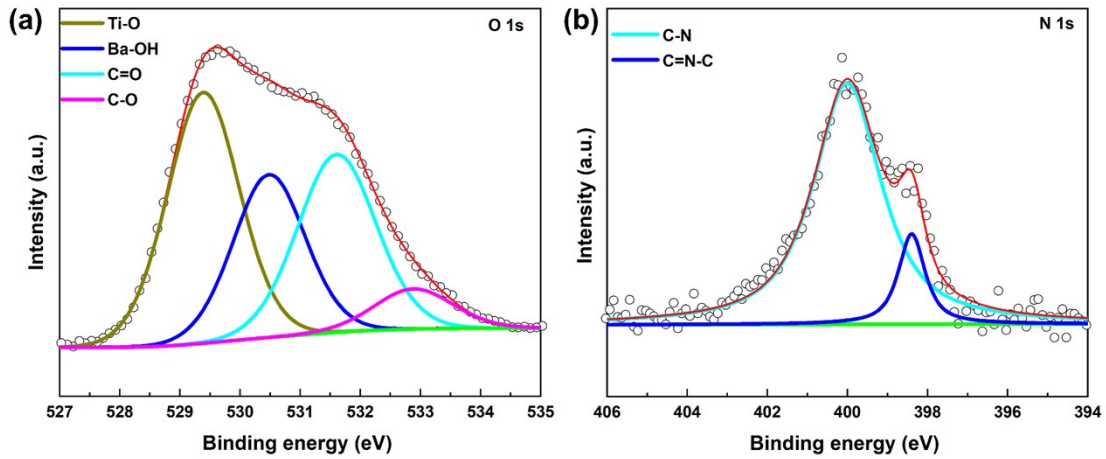

Fig. S3 High-resolution O 1s (a) and N 1s (b) spectra of PcPFI@BT

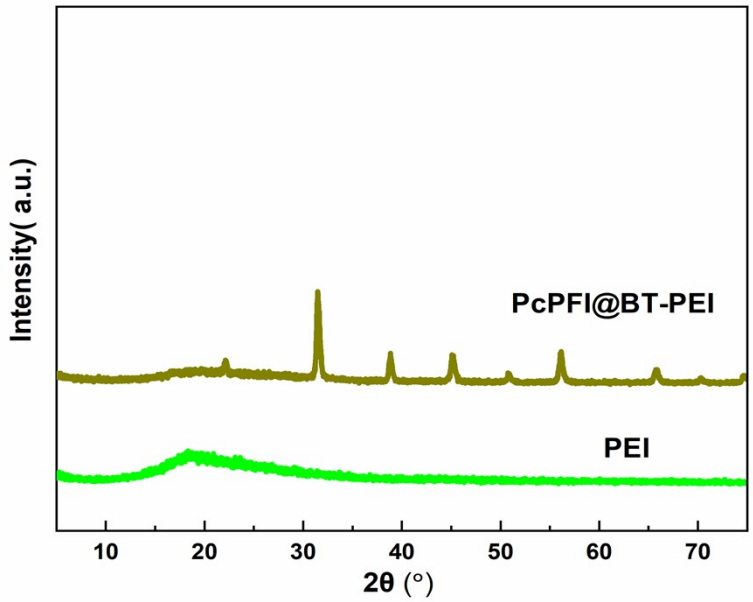

Fig. S4 XRD patterns of PEI and 5vol% PcPFI@BT-PEI

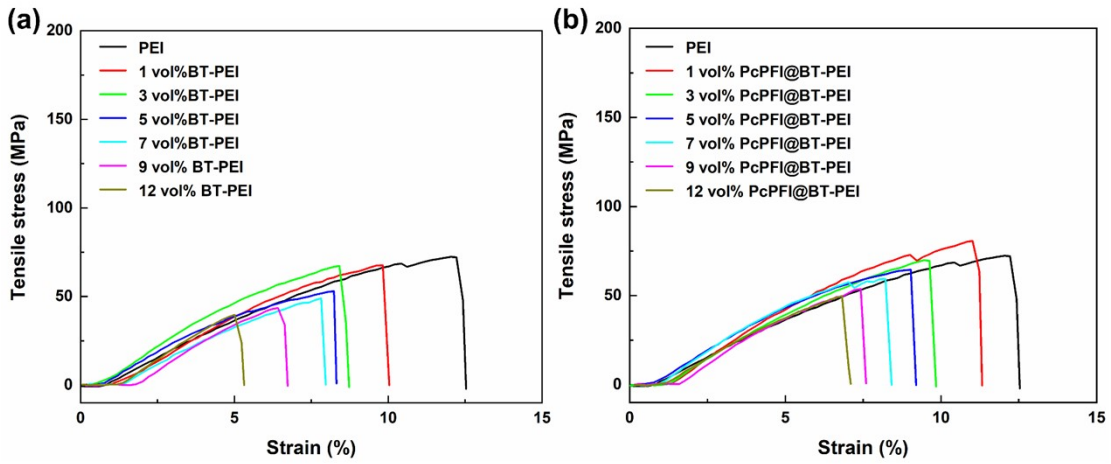

Fig. S5 Stress-strain curves of BT-PEI (a) and PcPFI@BT-PEI (b) with the filler content from 0 to 12 vol%

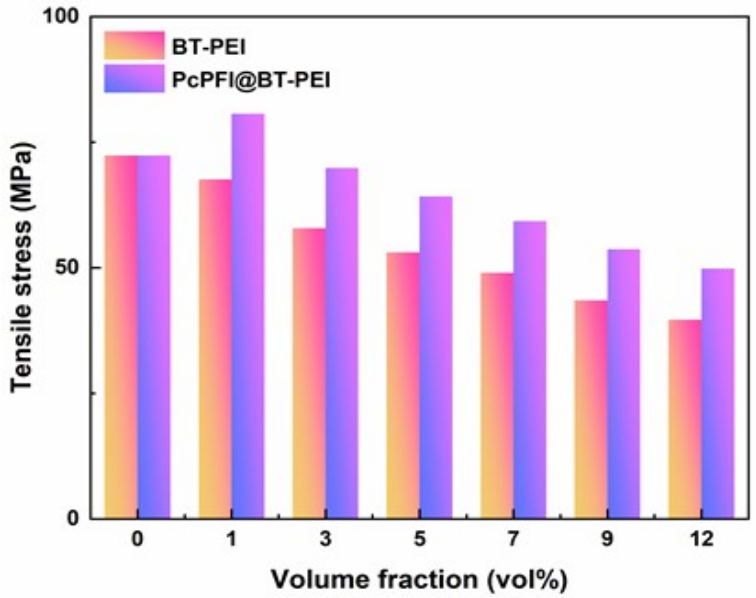

Fig. S6 Tensile stress of the two sets of composites with filler content from 0 to 12 vol%

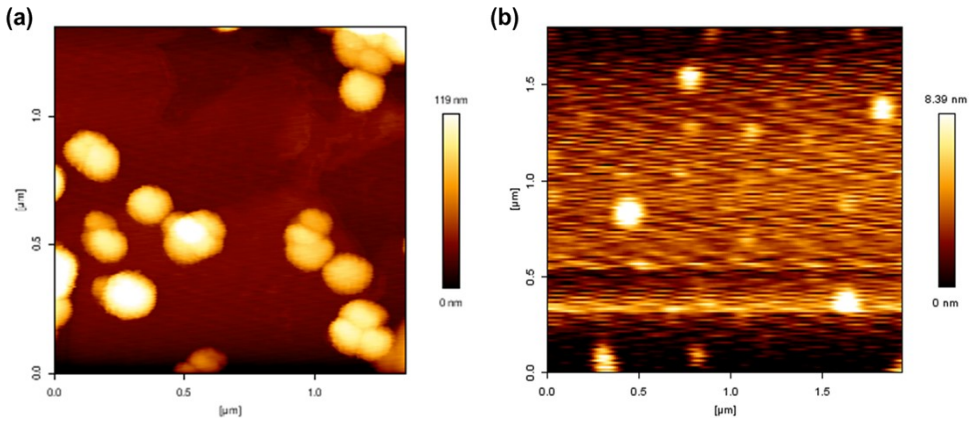

Fig. S7 AFM images of BT-PEI (a) and PcPFI@BT-PEI (b)

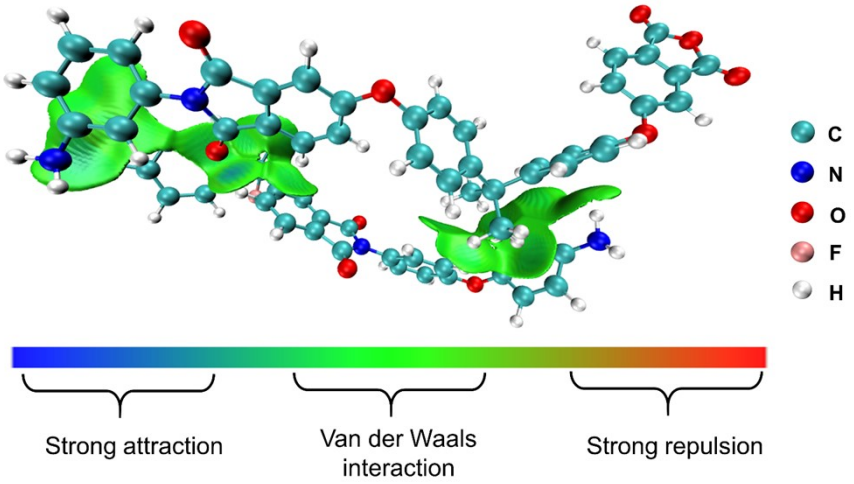

Fig. S8 The intermolecular interaction between the similar components of PEI and PcPFI

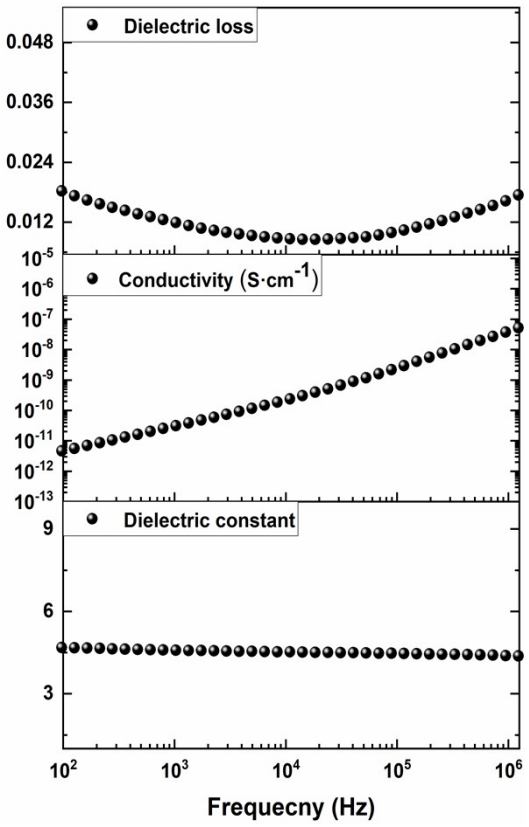

Fig. S9 Dielectric properties of PcPFI polymer from 10^2 to 10^6 Hz

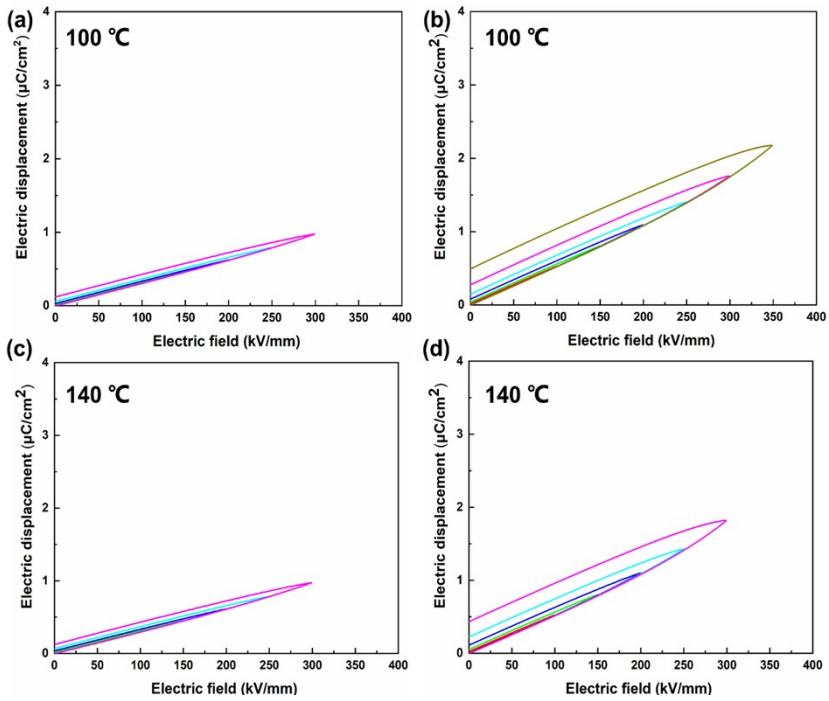

Fig. S10 D-E loops of PEI ((a), (c)) and 1 vol% PcPFI@BT-PEI ((b), (d)) at 100 ℃ and 140 ℃

Table S1 The dielectric properties of the prepared composite and some related polymeric dielectrics reported in previous reports

Materials	Dielectric Constant (1 kHz)	Dielectric Loss (1 kHz)	Breakdown Strength (kV/mm)	Energy storage density (J/cm^3)	Charge-discharge efficiency (%)	Ref
10 vol% TiO_2-BT-TiO_2@dopa/PVDF	12.6	0.05	312.8	4.4	~30	S1
2 wt% PDA@BT/c-PVDF	~11	~0.07	242	2.9	75	S2
20 vol% BT-HCuPc/PES	~9.8	~0.044	~290	2.0	84	S3
5 wt% BT@PI/PVDF	15	0.046	178.2	Not given	Not given	S4
3 vol% BT-Bi($Li_{0.5}Nb_{0.5}$)O_3/ P(VDF-HFP)	~10	~0.025	497	14.2	55.5	S5
10 wt% BNNSs/RC	7	0.02	370	4.1	~75	S6
10 vol% BT-1.2 vol% GO/ P(VDF-HFP)	66.2	0.048	40	Not given	Not given	S7
1 wt% HfO_2@BT/P(VDF-HFP)	~10	~0.016	466.1	10.7	68.1	S8
10 wt% BT-$Ni(OH)_2$/ P(VDF-HFP)	14.8	0.038	330	7.13 (calculated)	Not given	S9
1 vol% PcPFI@BT/PEI	**4.35**	**0.014**	**381**	**3.04**	**89.25**	**This work**

Reference

S1 Prateek, R. Bhunia, S. Siddiqui, A. Garg and R. K. Gupta, *ACS Appl. Mater. Interfaces*, 2019, **11**, 14329-14339.

S2 Y. Xie, Y. Yu, Y. Feng, W. Jiang and Z. Zhang, *ACS Appl. Mater. Interfaces*, 2017, **9**, 2995-3005.

S3 W. Xu, G. Yang, L. Jin, J. Liu, Y. Zhang, Z. Zhang and Z. Jiang, *ACS Appl. Mater. Interfaces*, 2018, **10**, 11233-11241.

S4 X. Xie, C. Yang, X.-d. Qi, J.-h. Yang, Z.-w. Zhou and Y. Wang, *Chem. Eng. J.*, 2019, **366**, 378-389.

S5 P.-J. Wang, D. Zhou, J. Li, L.-X. Pang, W.-F. Liu, J.-Z. Su, C. Singh, S. Trukhanov and A. Trukhanov, *Nano Energy*, 2020, **78**, 105247.

S6 J. Lao, H. Xie, Z. Shi, G. Li, B. Li, G.-H. Hu, Q. Yang and C. Xiong, *ACS Sustain. Chem. Eng.*, 2018, **6**, 7151-7158.

S7 H. Luo, Z. Wu, X. Zhou, Z. Yan, K. Zhou and D. Zhang, *Compos. Sci. Technol.*, 2018, **160**, 237-244.

S8 C. Chen, Y. Xie, J. Liu, J. Li, X. Wei and Z. Zhang, *Compos. Sci. Technol.*, 2020, **188**, 107968.

S9 Y. Yang, C. Sun, H. Deng and Q. Fu, *Compos. Sci. Technol.*, 2020, **198**.