Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information

Tunable dielectric polarization and breakdown behavior for high energy storage capability in P(VDF-TrFE-CFE)/PVDF polymer blended composite films

Pu Mao[a,b], Jiping Wang[a,*], Lixue Zhang[a,*], Qinzhao Sun[a], Xixia Liu[b], Liqiang He[a], Shujuan Liu[a], Siwen Zhang[b], Hao Gong[b,*]

[a] State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, 710049, China

[b] Department of Materials Science and Engineering, National University of Singapore, 117576, Singapore

---

[*] Corresponding authors.

E-mail addresses: lxzhang@mail.xjtu.edu.cn (L. Zhang),

jpwang@mail.xjtu.edu.cn (J. Wang),

msegongh@nus.edu.sg (H. Gong).

Table S1. Thermal properties of pure PVDF films and its polymer composite films with different PTC (P(VDF-TrFE-CFE)) terpolymer contents of 10 wt%, 20 wt%, 30 wt%, 40 wt% and 50 wt%.

Samples	PTC blending (wt%)	T_m (°C)	T_c (°C)	ΔH_m (J/g)	X_c (%)
PVDF/PTC0	0	159.65	132.54	34.06	32.53
PVDF/PTC1	10	159.98	128.21	29.14	27.83
PVDF/PTC2	20	160.19	128.05	20.68	19.75
PVDF/PTC3	30	160.16	126.68	17.47	16.69
PVDF/PTC4	40	159.46	128.14	26.15	24.98
PVDF/PTC5	50	159.07	126.66	19.40	18.50

Notes: Melting temperature (T_m), Crystallization temperature (T_c), Melting Enthalpy (ΔH_m), The degree of crystallinity (X_c).

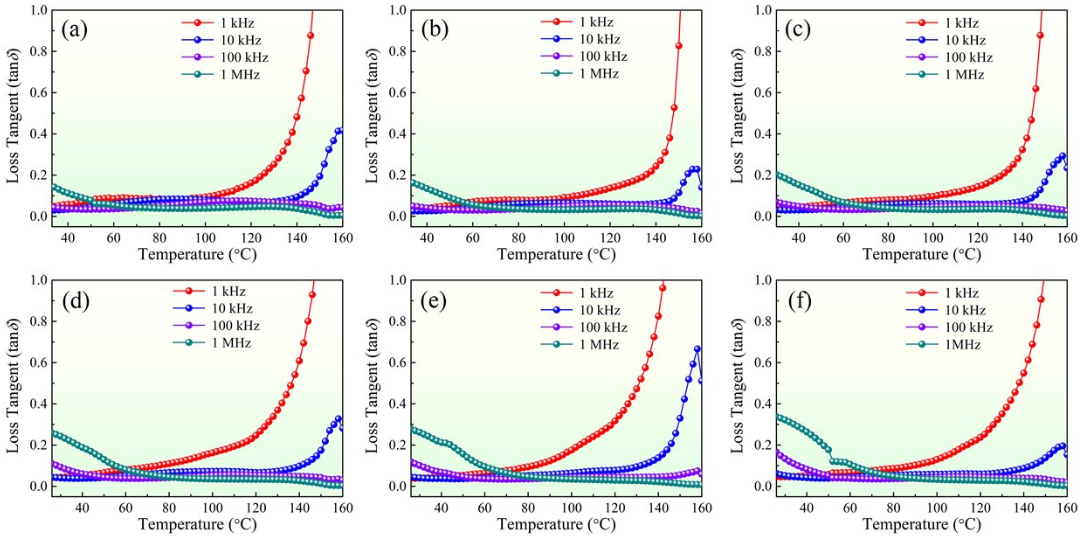

Fig. S1. Temperature-dependence of loss tangent (tanδ) at 1 kHz, 10 kHz, 100 kHz and 1 MHz for the pure PVDF films (a) and its polymer composite films with different PTC terpolymer contents of 10 wt% (b), 20 wt% (c), 30 wt% (d), 40 wt% (e) and 50 wt% (f).

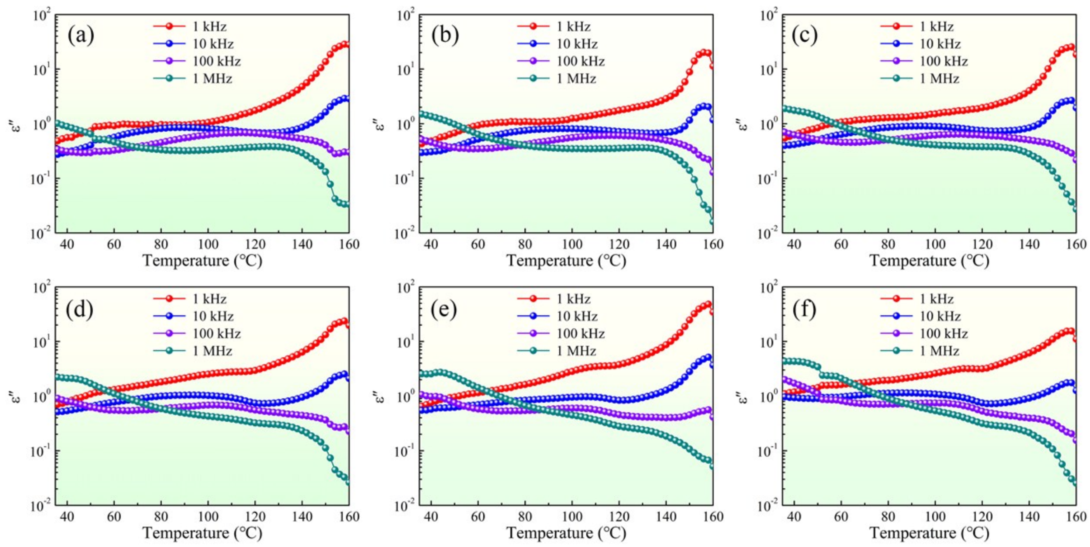

Fig. S2. Temperature-dependence of dielectric loss (ε'') at 1 kHz, 10 kHz, 100 kHz and 1 MHz for the pure PVDF films (a) and its polymer composite films with different PTC terpolymer contents of 10 wt% (b), 20 wt% (c), 30 wt% (d), 40 wt% (e) and 50 wt% (f).

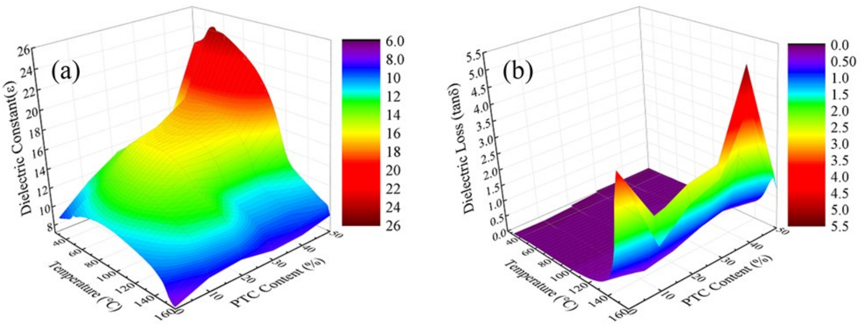

Fig. S3. Temperature-dependence of dielectric constant (ε') (a) and loss tangent ($\tan\delta$) (b) at 1 kHz for the pure PVDF films and its polymer composite films with different PTC terpolymer contents of 10 wt%, 20 wt%, 30 wt%, 40 wt% and 50 wt%.

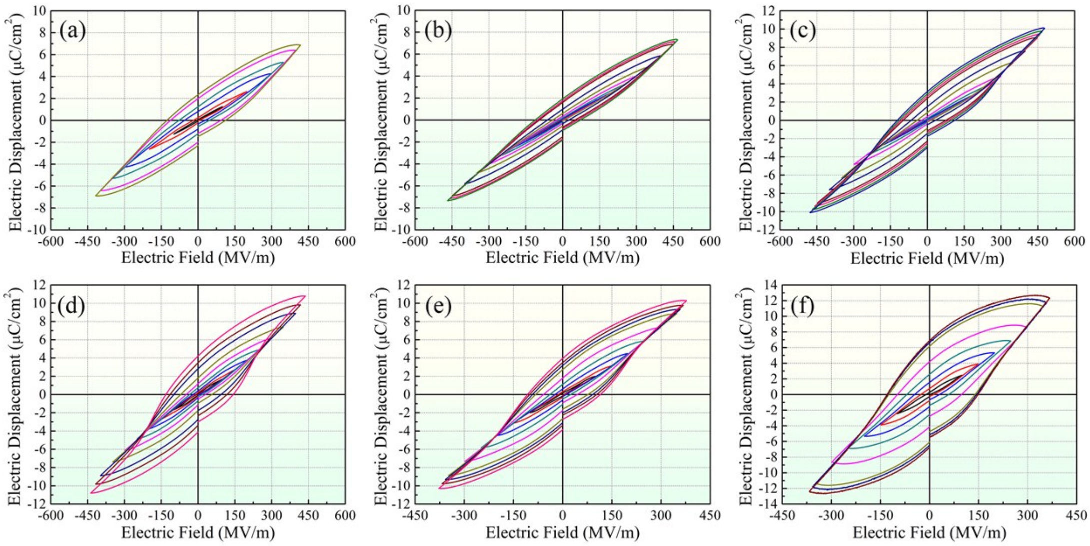

Fig. S4. D-E loops of the pure PVDF films (a) and its polymer composite films with different PTC terpolymer contents of 10 wt% (b), 20 wt% (c), 30 wt% (d), 40 wt% (e) and 50 wt% (f).

Table S2. Weibull breakdown strength E_b and Weibull modulus β of the pure PVDF films and its polymer composite films with different PTC terpolymer contents of 10 wt%, 20 wt%, 30 wt%, 40 wt% and 50 wt%.

Samples	PTC blending contents (wt%)	E_b (Mv/m)	β
PVDF/PTC0	0	420.4	11.09
PVDF/PTC1	10	472.7	13.79
PVDF/PTC2	20	482.6	17.91
PVDF/PTC3	30	435.6	10.70
PVDF/PTC4	40	384.0	15.20
PVDF/PTC5	50	371.6	12.16

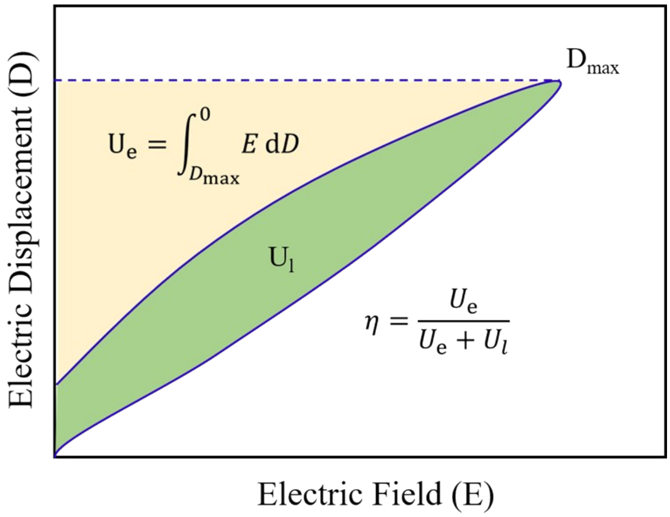

Fig. S5. Schematic diagram of D-E hysteresis loop. Where D_{max} represents maximal electric displacement, the discharged energy density is determined from the area in yellow, the green area reveals the loss of energy density, and the discharged energy efficiency is determined from the ratio between the yellow area and the total area of yellow and green.