Supporting Information

Constructing dual interfacial gold nanodot interlayers in sandwich-structured $BaTiO_3$/P(VDF-HFP) composites for high energy storage density

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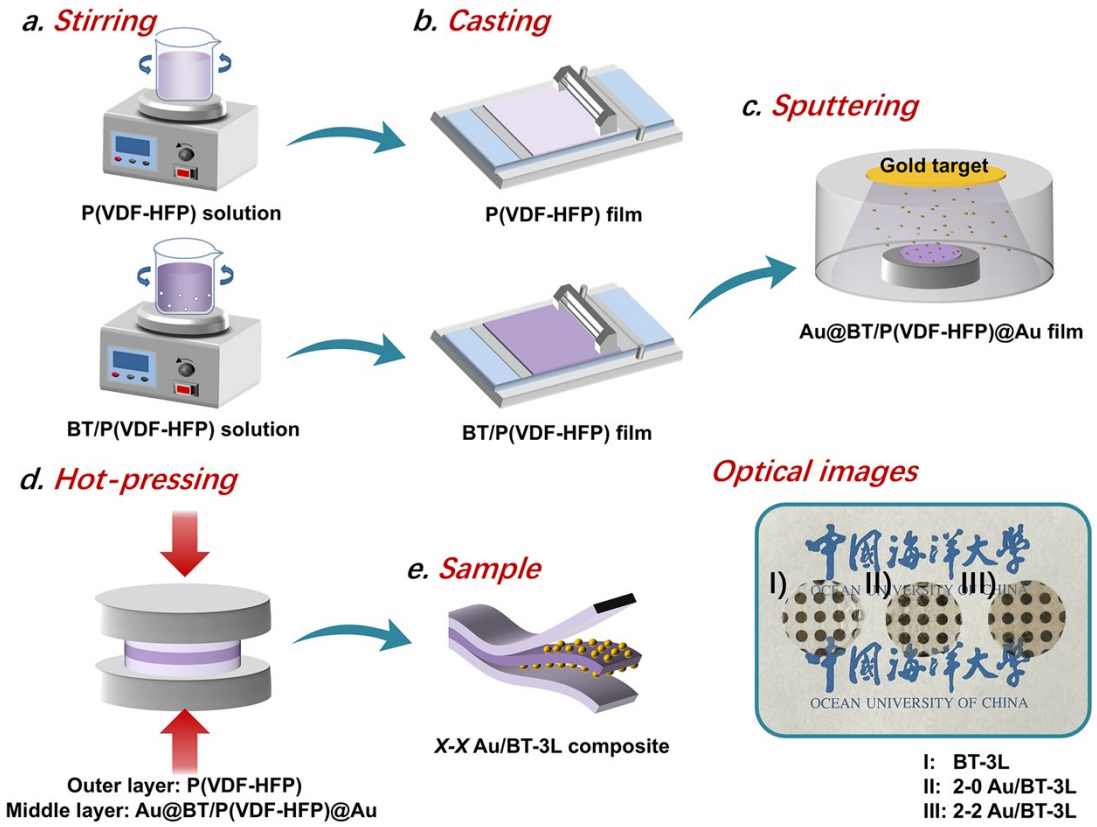

Fig. S1 Preparation process flow of P(VDF-HFP) film, BT/P(VDF-HFP) film and *x*-*x* Au/BT-3L composite (Inset: optical images of BT-3L, 2-0 Au/BT-3L and 2-2 Au/BT-3L composites).

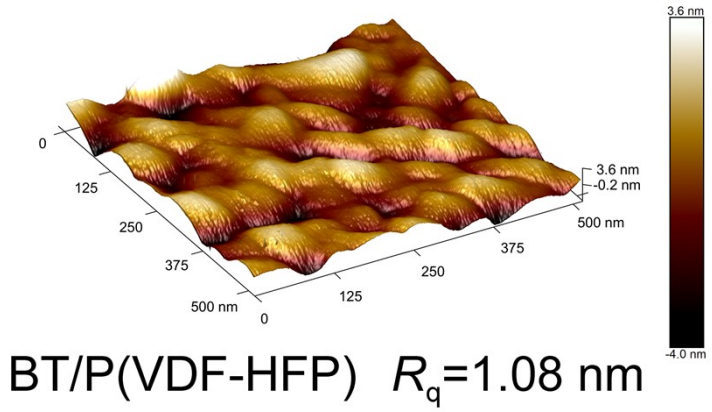

Fig. S2 The 3D AFM morphology and surface roughness of BT/P(VDF-HFP) film.

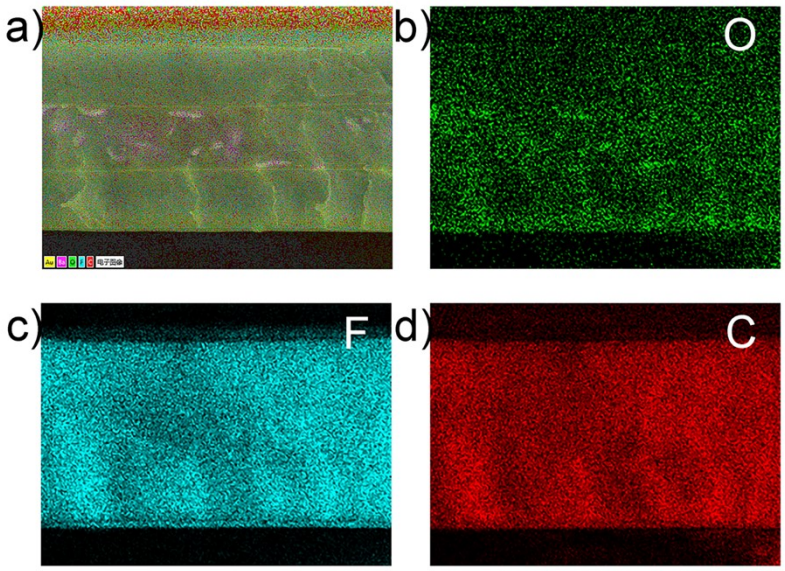

Fig. S3 EDS mapping of O, F and C elements corresponds to 2-2 Au/BT-3L trilayer composite.

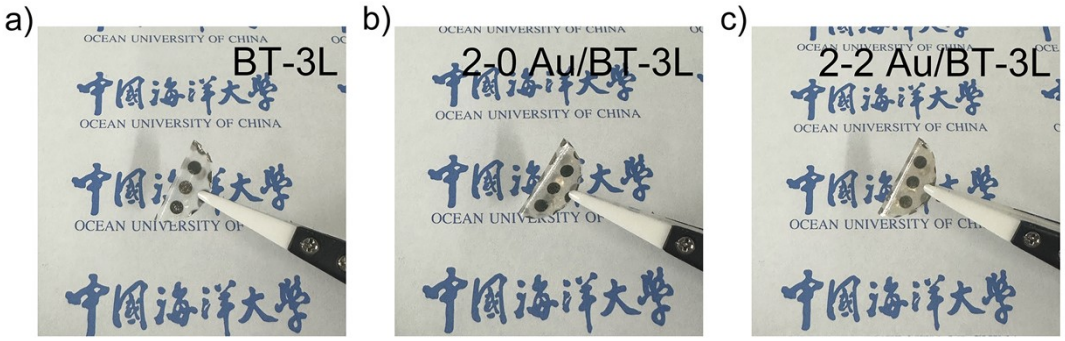

Fig. S4 The optical images of flexibility validation of BT-3L, 2-0 Au/BT-3L and 2-2 Au BT/3L composites.

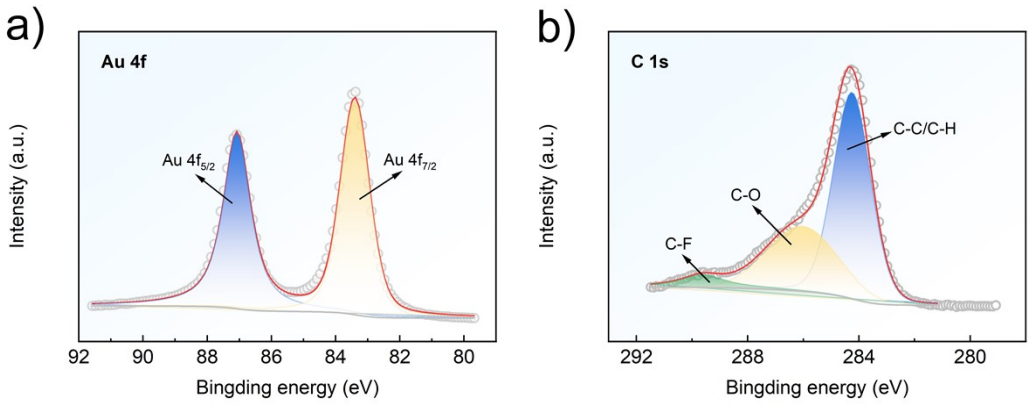

Fig. S5 The XPS high-resolution spectra of (a) Au 4f and (b) C 1s for BT/P(VDF-HFP) film deposited with Au nanodots at sputtering time of 2 min.

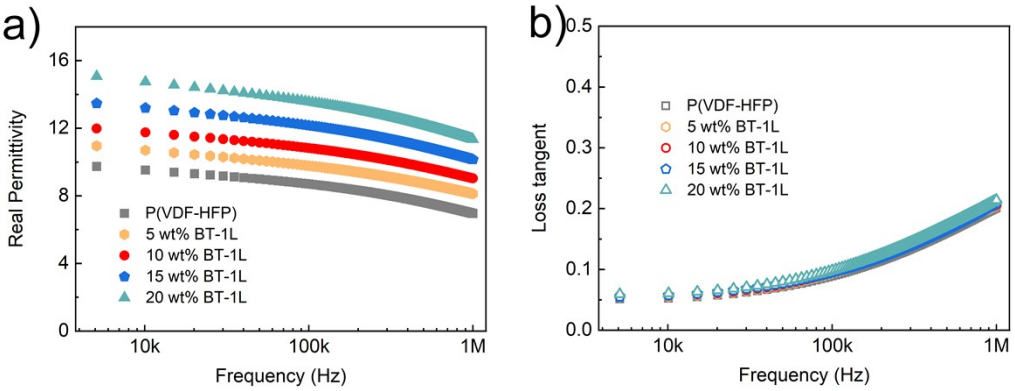

Fig. S6 (a) Dielectric constant and (b) loss of BT-1L composites.

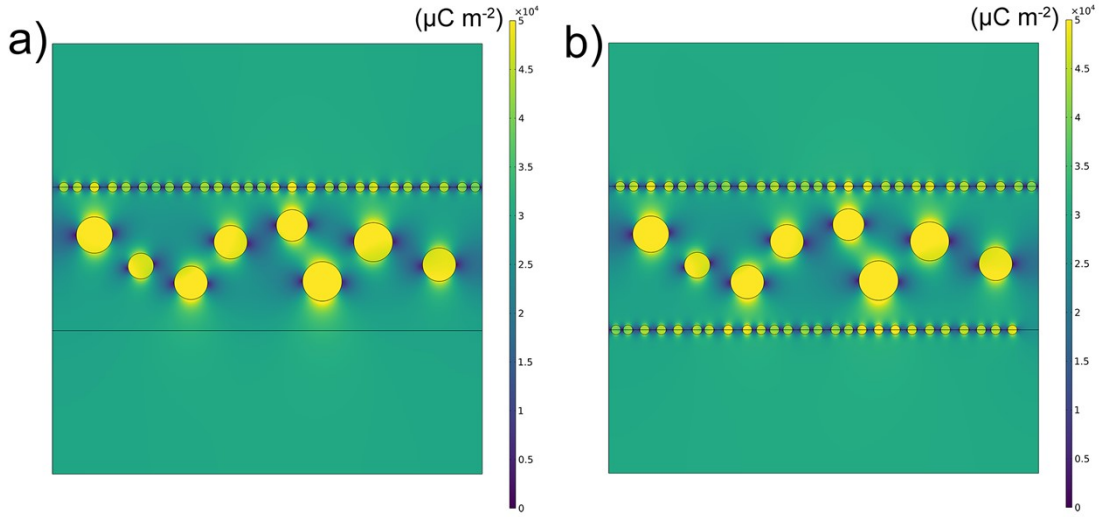

Fig. S7 The simulated polarization distribution of (a) *x*-0 Au/BT-3L and (b) *x*-*x* Au/BT-3L composites.

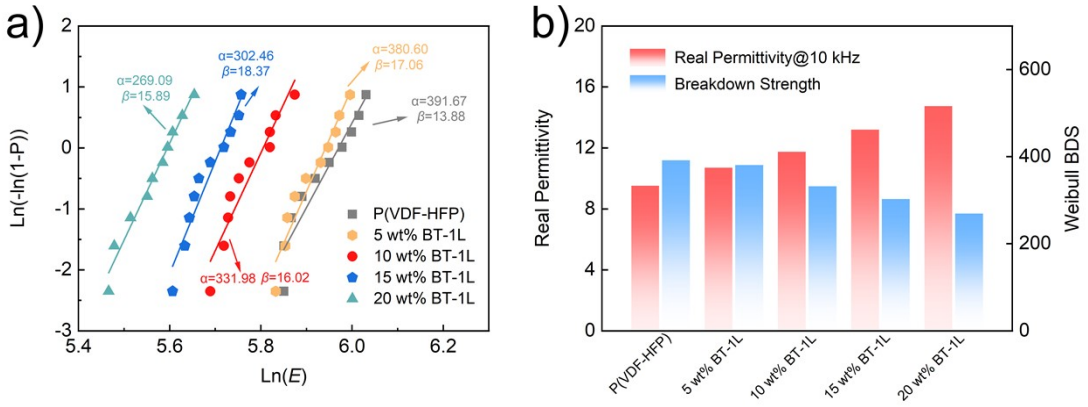

Fig. S8 (a) Weibull distribution plots of BT-1L composites. (b) Comparison of dielectric and breakdown properties of BT-1L composites.

Table S1 The summarized breakdown strengths (E_b) in this work.

Sample	Weibull E_b (MV m^{-1})	Shape Factor (β)
P(VDF-HFP)	391.67	13.88
5 wt% BT/1L	380.60	17.06
10 wt% BT/1L	331.98	16.02
15 wt% BT/1L	302.46	18.37
20 wt% BT/1L	269.09	15.89
BT-3L	416.67	18.18
1-0 Au/BT-3L	465.38	20.86
2-0 Au/BT-3L	498.37	21.96
3-0 Au/BT-3L	448.11	18.53
4-0 Au/BT-3L	407.72	19.63
1-1 Au/BT-3L	501.24	20.43
2-2 Au/BT-3L	520.08	23.84
3-3 Au/BT-3L	469.07	22.54
4-4 Au/BT-3L	415.09	22.97

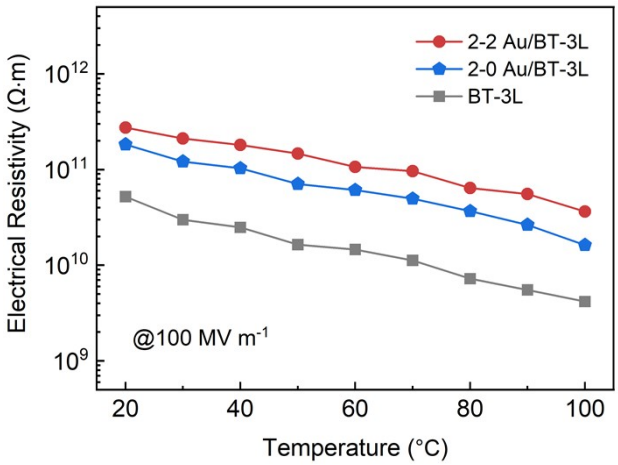

Fig. S9 The temperature dependent resistivity of BT-3L, 2-0 Au/BT-3L and 2-2 Au/BT-3L composites, respectively.

Table S2 The calculated results according to Equation (8) when d = 5 μm.

Radius of Au QDs	1 nm	1.5 nm	2 nm	2.5 nm	3 nm	4 nm
Capacitance *C* ($\times10^{-18}$ F)	1.0588	1.5884	2.1179	2.6475	3.1772	4.2367
$\boldsymbol{e^2/2C}$ ($\times10^{-20}$ J)	1.2089	0.8059	0.6044	0.4835	0.4029	0.3021
T (K)	875.57	583.69	437.74	350.18	291.80	218.83

Note: Here, $e \approx 1.6\times10^{-19}$ is electron charge, $k_B \approx 1.380649\times10^{-23}$ J K^{-1} is Boltzmann constant, $\varepsilon_0 = 8.85\times10^{-12}$ F m^{-1} is vacuum permittivity, ε_r is relative permittivity of P(VDF-HFP) matrix.

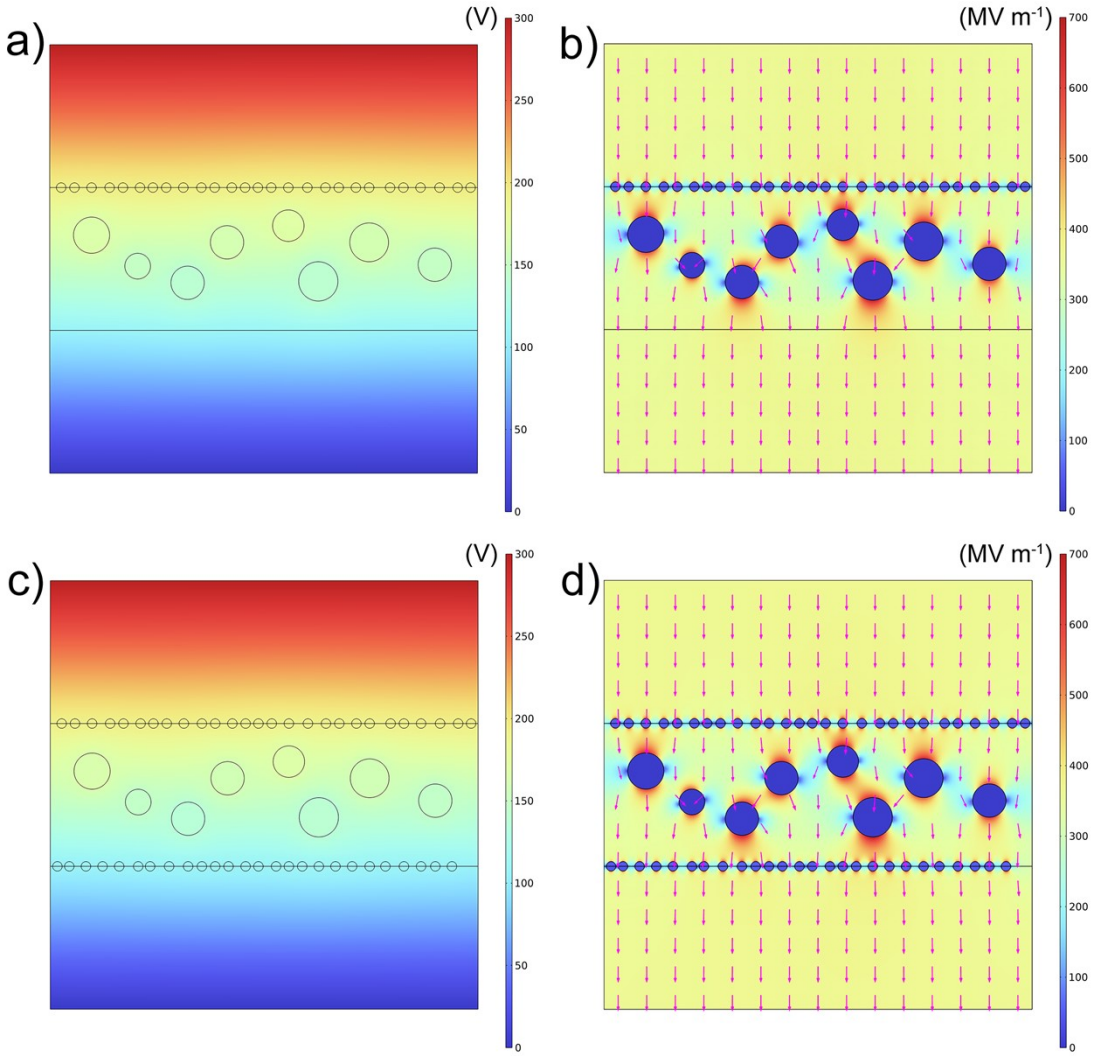

Fig. S10 The simulation of electric potential and electric field distribution of (a, b) *x*-0 Au/BT-3L composites and (c, d) *x*-*x* Au/BT-3L composites.

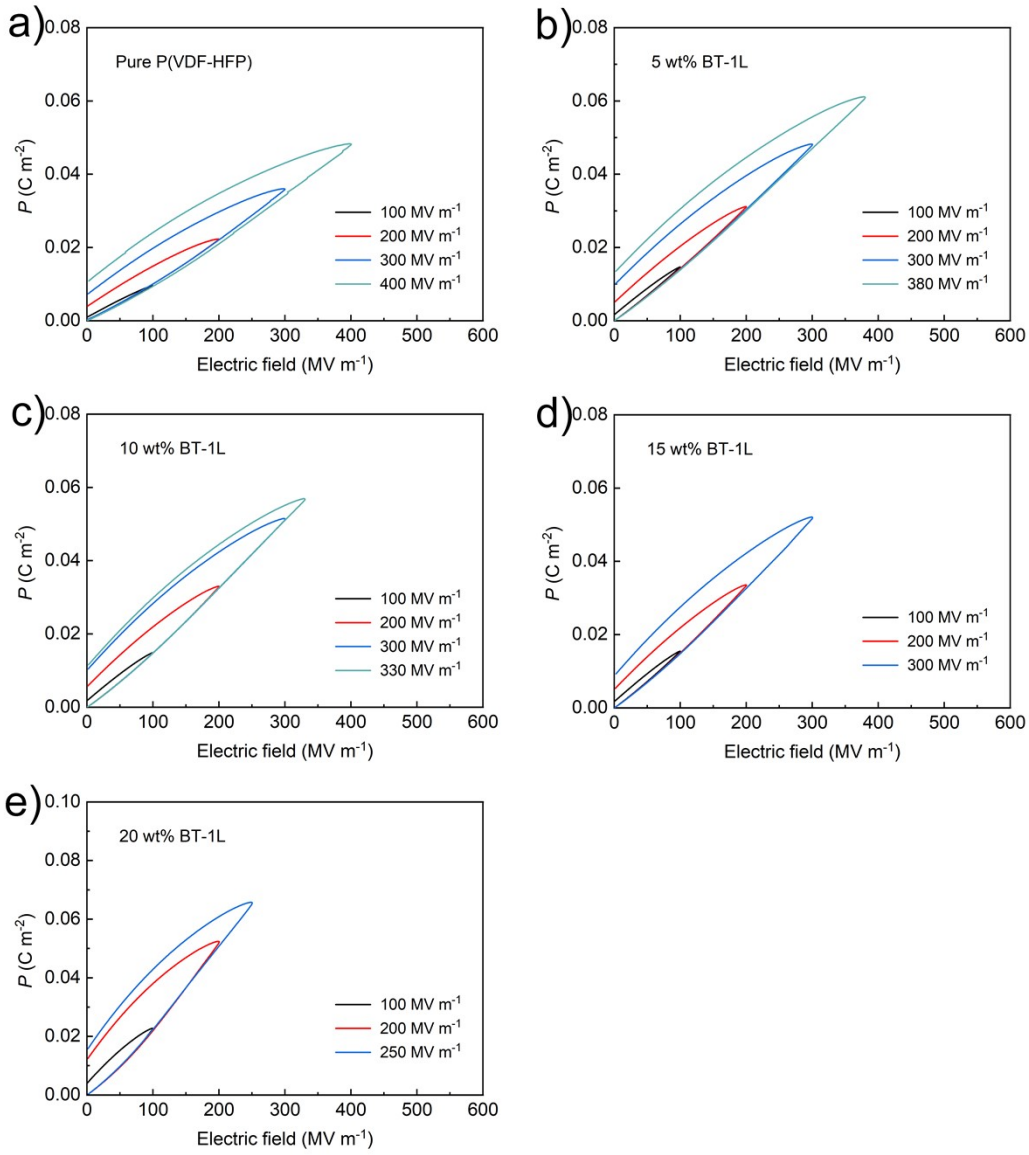

Fig. S11 The *D–E* loops of (a) pure P(VDF-HFP) and (b–e) BT-1L composites.

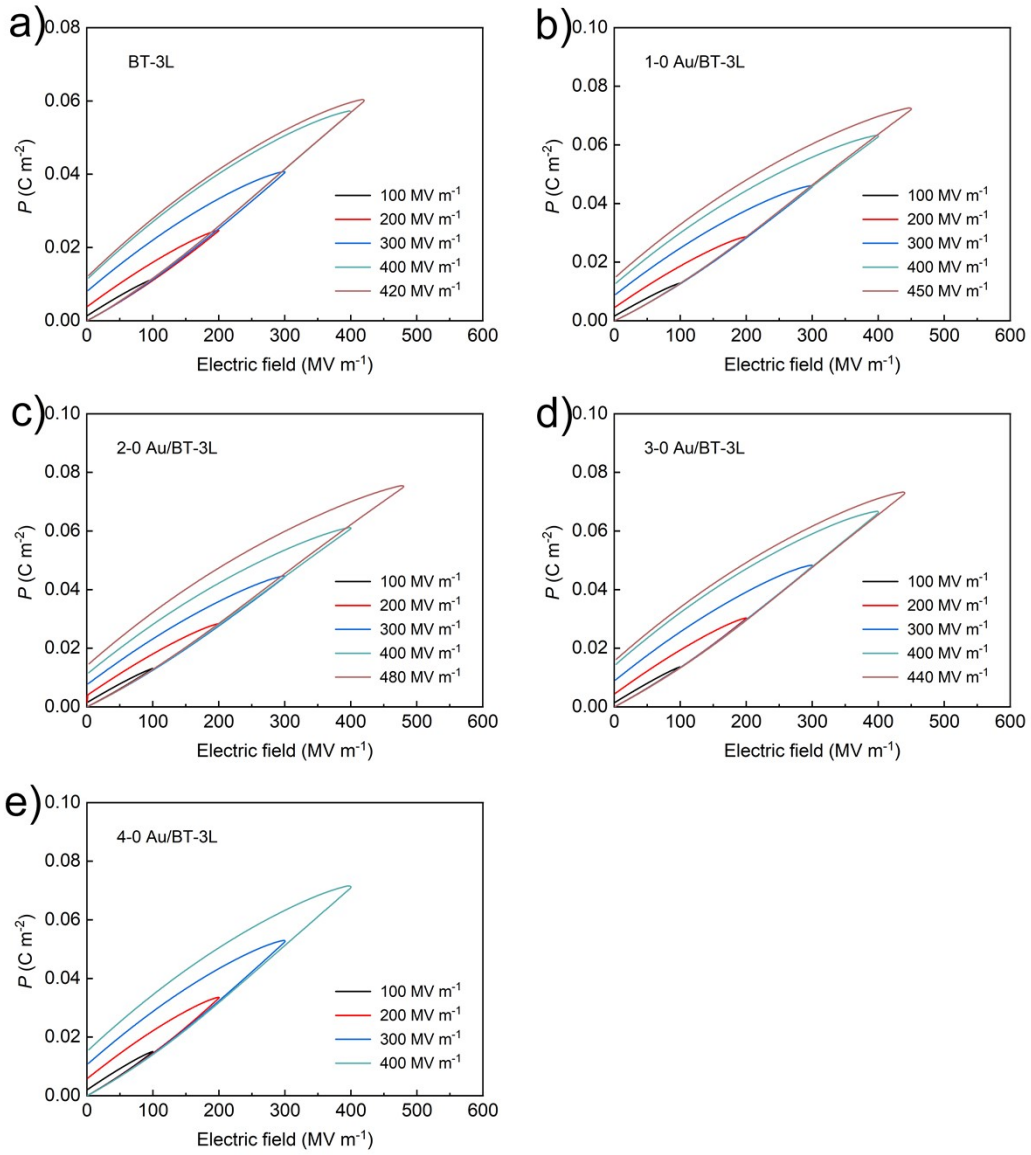

Fig. S12 The *D*–*E* loops of (a) BT-3L composite and (b–e) *x*-0 Au/BT-3L composites.

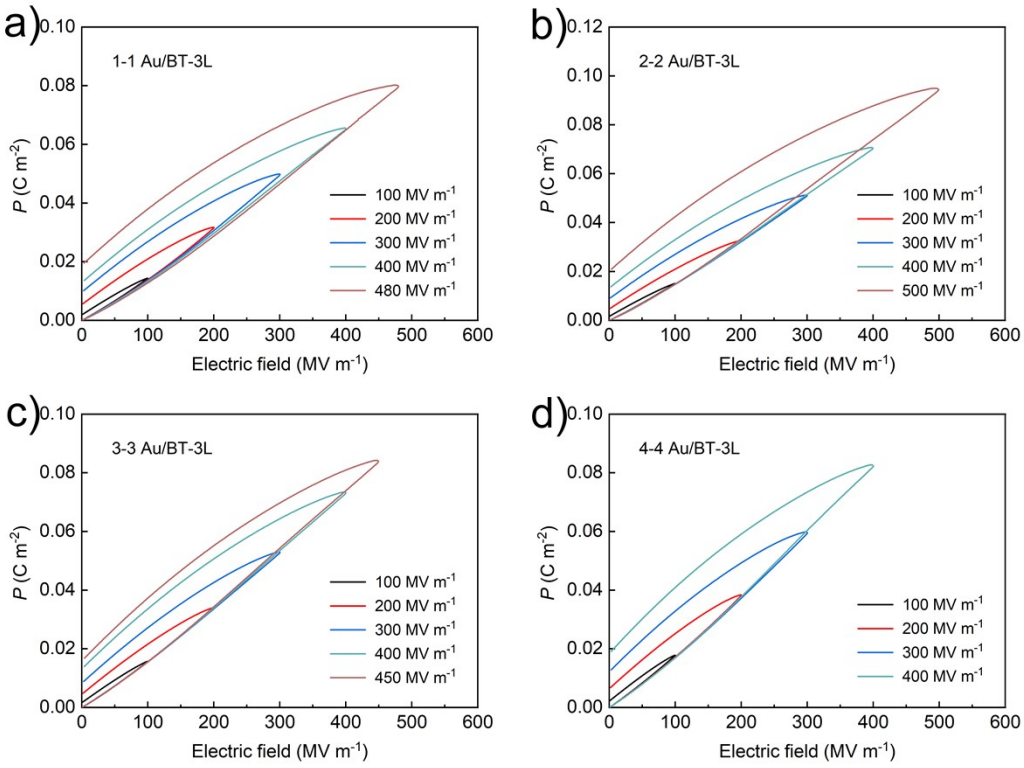

Fig. S13 (a–d) The *D*–*E* loops of *x*-*x* Au/BT-3L composites.

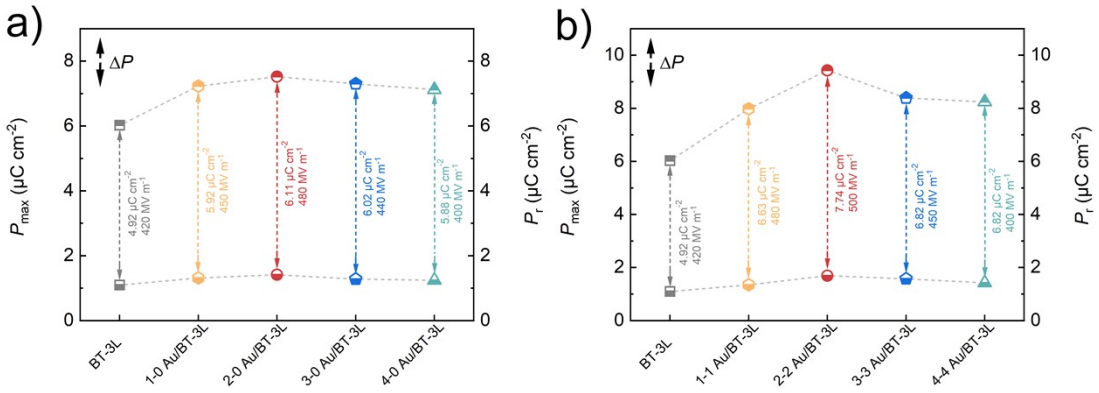

Fig. S14 The maximum polarization difference (Δ*P*) of (a) *x*-0 Au/BT-3L composites and (b) *x*-*x* Au/BT-3L composites.

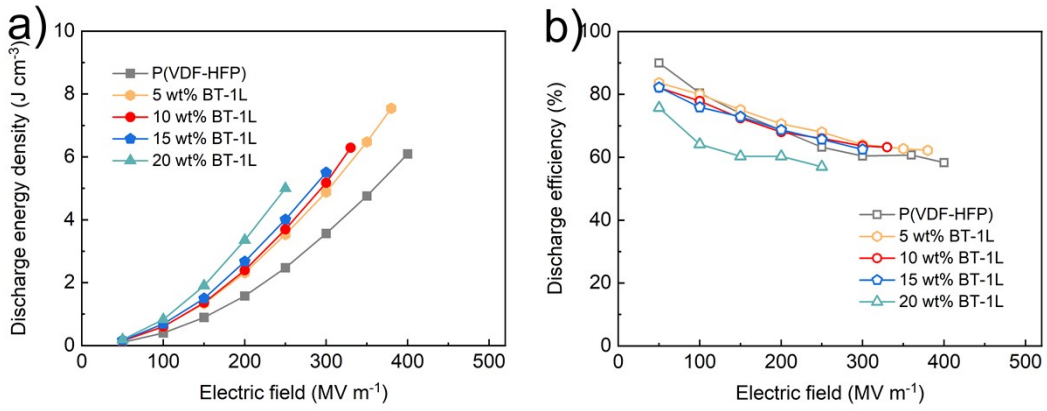

Fig. S15 (a) The discharge energy density (U_d) and (b) discharge effciency (η) of pure P(VDF-HFP) and BT-1L composites.

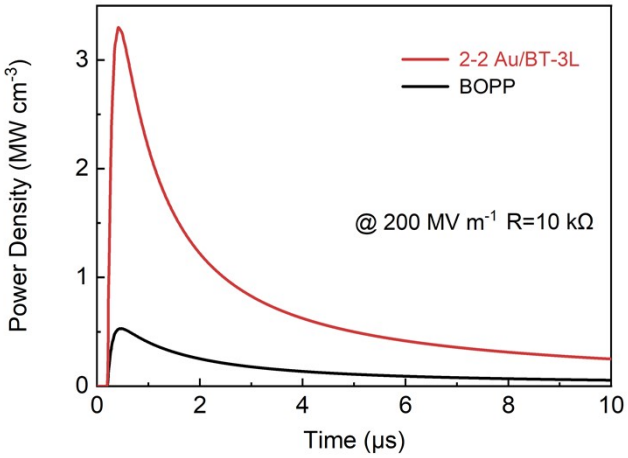

Fig. S16 The power density as a function of discharge time of 2-2 Au/BT-3L composite and BOPP.

The applied electric field was 200 MV m^{-1} and the loaded resistor was 10 kΩ. The discharge energy density (W_d) can be calculated using the equation:

$$W_d = \frac{\int U^2(t)\mathrm{d}t}{RV} \#\ (S1)$$

where U, t, R and V represent the discharge voltage, discharge time, load resistance and the volume of dielectrics, respectively.

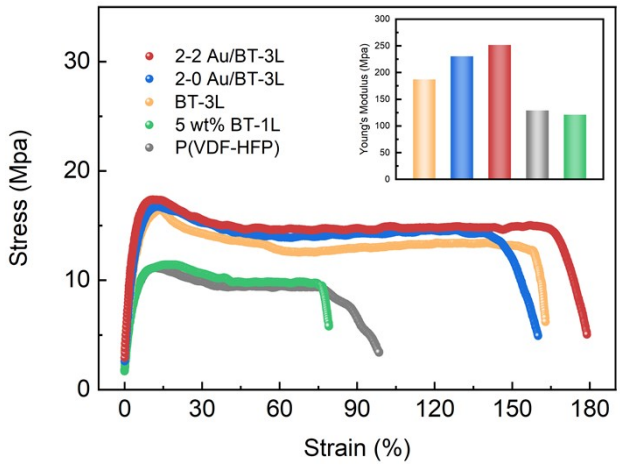

Fig. S17 The stress-strain curves of P(VDF-HFP), 5 wt% BT-1L, BT-3L, 2-0 Au/BT-3L and 2-2 Au/BT-3L composites. Inset: Young's modulus of these composites.