materials

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Supplementary Information

Construction of a Three-Dimensional $BaTiO_3$ Network for Enhanced Permittivity and Energy Storage of PVDF Composites

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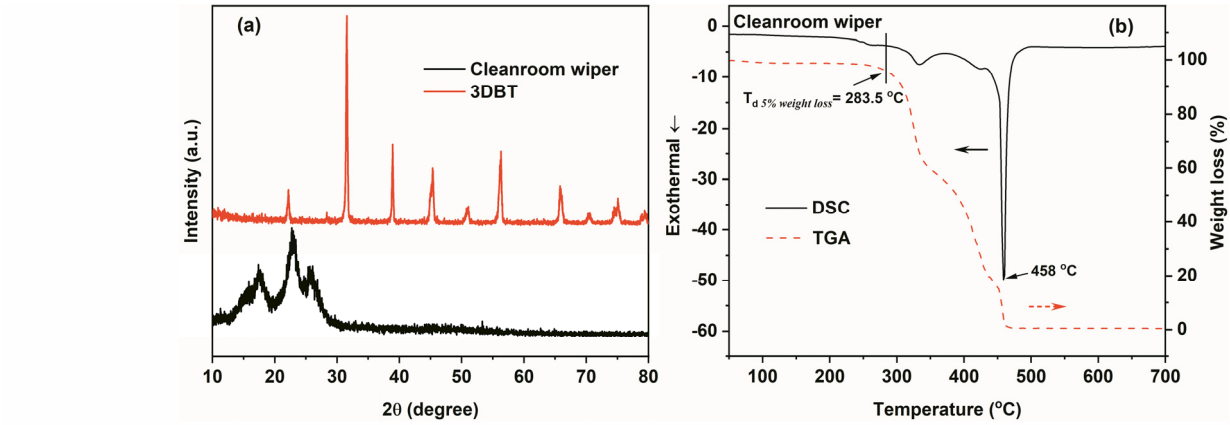

Figure S1. (**a**) XRD result and (**b**) Thermal performance of cleanroom wiper.

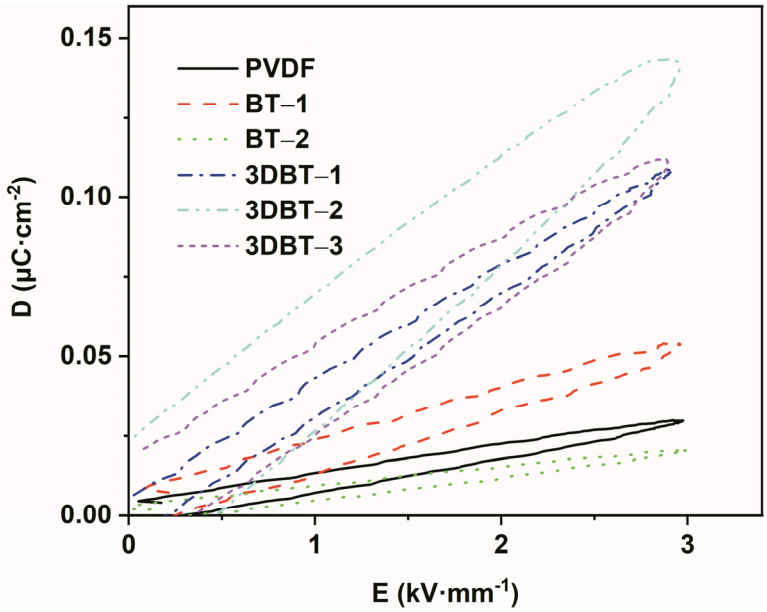

Figure S2. Unipolar D-E hysteresis loops of representative PVDF, BT-1, BT-2, 3DBT-1, 3DBT-2, and 3DBT-3, respectively.

Table S1. Dielectric and energy storage properties of the BT/polymer composites.

Matrix	Filler	Filler loading	Thickness	*f* (Hz)	ε′	Tanδ	E_b (Weillbull)	U	U/U_m	Ref.
PVDF	BST	40 vol%	–	1 kHz	40	0.19	45 kV·mm^{-1}	0.36 J·cm^{-3} (at 1 kV·mm^{-1})	<2.0	[6]
Epoxy	3D BT	16 vol%	0.5-1 μm	1 kHz	34.5	0.07	489.35 kV·cm^{-1}	8.3 mJ·cm^{-3} (at 100 kV·cm^{-1})	16.6	[10]
Epoxy	3D-BTO	10 vol%	1 mm	1 MHz	42	0.09	–	1.57 mJ·cm^{-3} (at 25 kV·cm^{-1})	1.45	[19]
P(VDF-HFP)	BT@Ag	20 vol%	30–40 μm	0.1 Hz	37.5	0.143	247.7 kV·mm^{-1}	3.21 J·cm^{-3} (at 140 kV·mm^{-1})	~3.2	[24]
P(VDF-HFP)	BT	20 vol%	30–40 μm	0.1 Hz	47	0.382	145.1 kV·mm^{-1}	2.45 J·cm^{-3} (at 140 kV·mm^{-1})	~1.4	[24]
PVDF	BT@BN	5 wt%	5 μm	1 kHz	11.3	0.027	580 kV·mm^{-1}	17.6 J·cm^{-3} (at 600 kV·mm^{-1})	2.8	S1
PVDF-epoxy	3D BT	25 vol%	0.1–1μm	1 kHz	200	0.07	322 kV·cm^{-1}	15.7 mJ·cm^{-3} (at 100 kV·cm^{-1})	3.48	S2
PVDF	PHEMA@BT	20 vol%	30–50 μm	1 kHz	20.2	0.03	~140 kV·mm^{-1}	2.18 J·cm^{-3} (at 140 kV·mm^{-1})	~1.1	S3
PVDF	BT@Ni	3 vol%	10–15 μm	1 kHz	12.57	0.027	369 kV·mm^{-1}	9.55 J·cm^{-3} (at 350 kV·mm^{-1})	2.08	S4
PVDF	3D BT	7.5 vol%	~130 μm	100 Hz	25.3	0.057	73.8 kV·mm^{-1}	1.60 mJ·cm^{-3} (at 3 kV·mm^{-1})	4.47	This work

Note: BST= barium strontium titanate; PHEMA = poly(hydroxyethyl methacrylate); U_m is the energy density of pure matrix.

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