

Supplementary Information

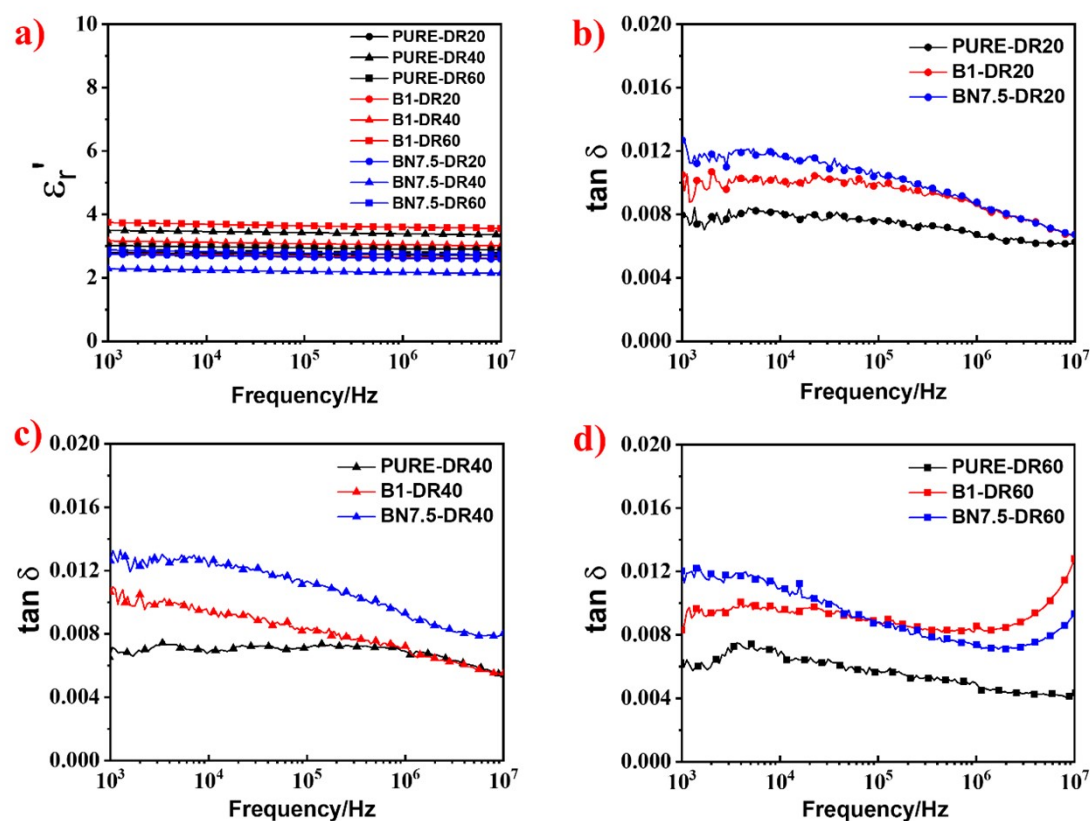


Figure S1. Dielectric constant and loss of the drawn pure UHMPWE and BN/UHMPWE composites with different filler concentration and draw ratios, in the frequency between 10^3 and 10^7 Hz.

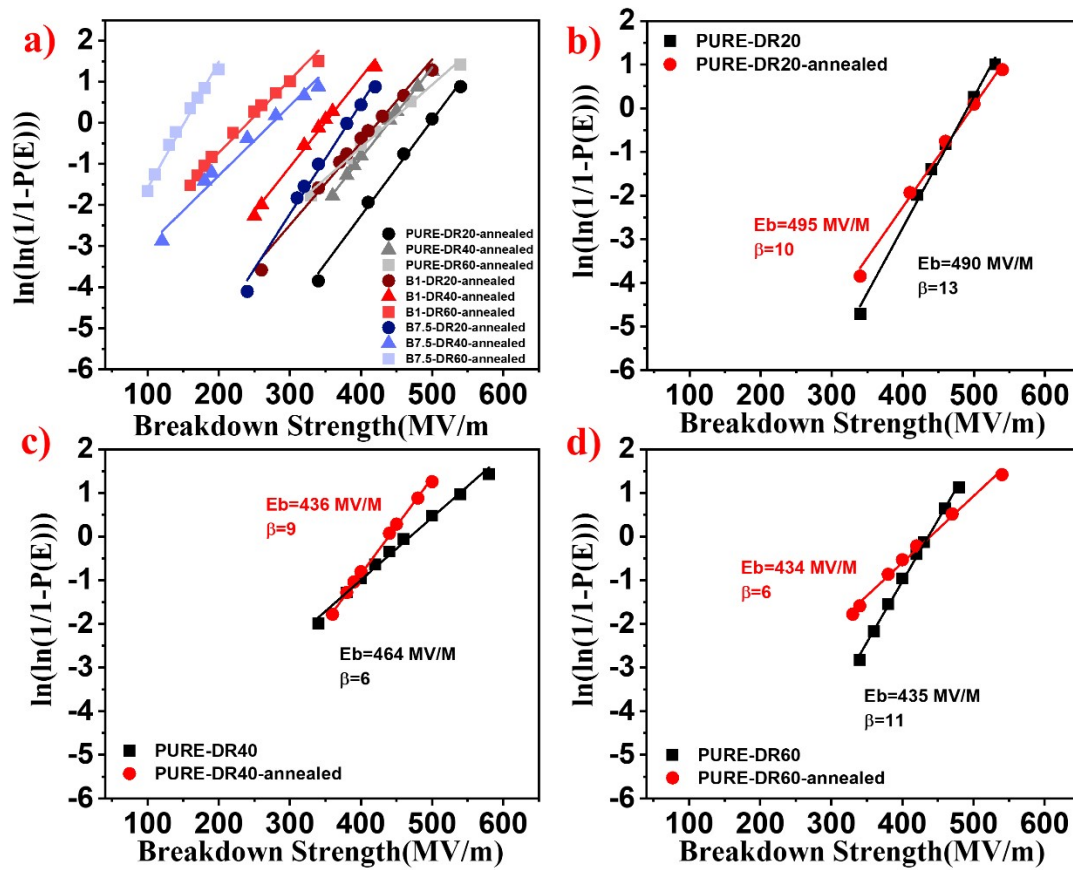


Figure S2. a) Weibull distribution of the breakdown strength of drawn pure UHMPWE and BN/UHMWPE composites films with 0, 1, 7.5wt% BN, after the anneal treatment. b-c) Comparison of the breakdown strength of pure UHMWPE with different draw ratios.

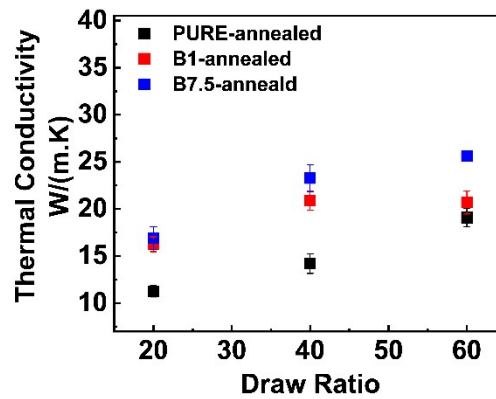


Figure S3. The thermal conductivity of drawn pure UHMPWE and BN/UHMWPE composites after annealing treatment.

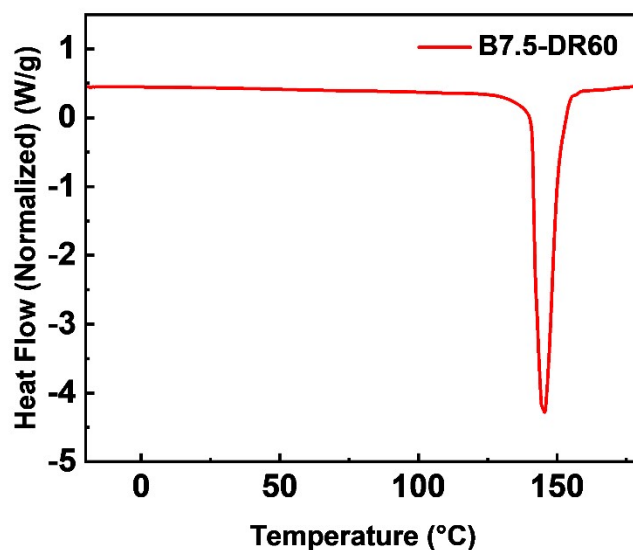


Figure S4. The normalized heat flow of sample B7.5-DR60 along with the temperature during the heating cycle of the DSC scans at a heating rate of $10^{\circ}\text{C}\cdot\text{min}^{-1}$, the peak at 145°C denotes the melting point. This was measured by by differential scanning calorimetry (DSC) (DSC 25, TA instrument). The B7.5-DR60 sample was heated from -20°C to 180°C under a N_2 atmosphere and a heating rate of $10^{\circ}\text{C}\cdot\text{min}^{-1}$.

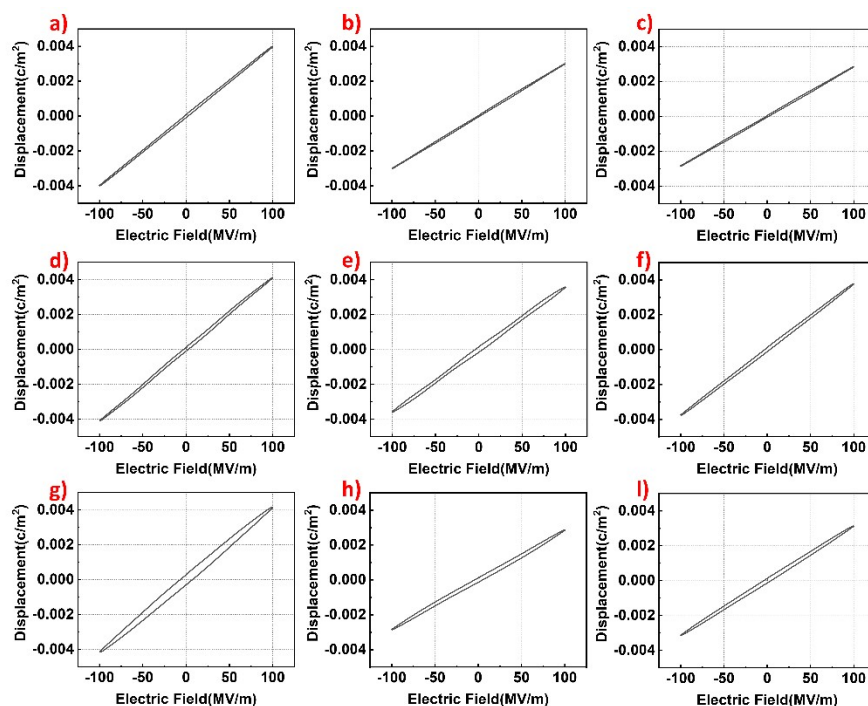


Figure S5. D-E loop at 100MV/m of drawn pure UHMWPE and BN/UHMWPE composites before anneal treatment. From the left to the right: films with draw ratio of 20, 40 and 60; From top to the bottom: films with 0, 1, 7.5wt% BN fillers

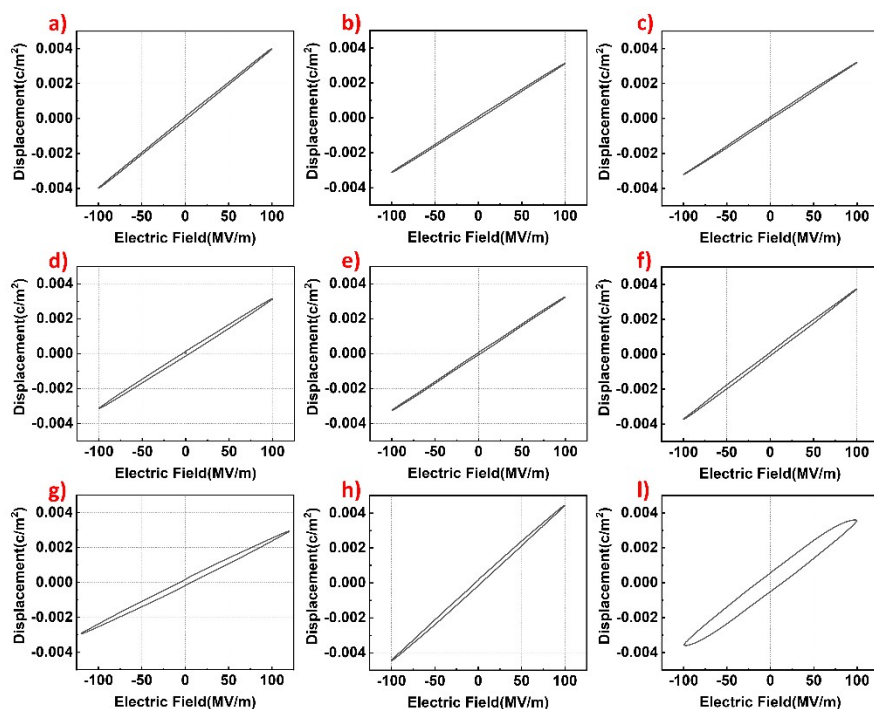


Figure S6. D-E loop at 100MV/m of drawn pure UHMPWE and BN/UHMPWE composites after anneal treatment. From the left to the right: films with draw ratio of 20, 40 and 60; From top to the bottom: films with 0, 1, 7.5wt% BN fillers

Table S1. A summary of the fabricated films with different filler concentrations and draw ratios. (refer to section 2.2 of the manuscript for denotation of the abbreviations)

Draw Ratio \ BN/wt%	20	40	60
0	PURE-DR20	PURE-DR40	PURE-DR60
1	B1-DR20	B1-DR40	B1-DR60
7.5	B7.5-DR20	B7.5-DR20	B7.5-DR20

Table S2. A summary of the characteristic breakdown strength (E_b) and b of the drawn pure UHMWPE and BN/UHMWPE composites films before and after anneal treatment, calculated from Weibull distribution.

	E_b	b
	(MV/m)	
PURE-DR20	490	13
PURE-DR40	464	6

PURE-DR60	435	11
B1-DR20	351	7
B1-DR40	290	7
B1-DR60	260	4
B7.5-DR20	299	3
B7.5-DR40	288	5
B7.5-DR60	261	5
PURE-DR20-annealed	495	10
PURE-DR40-annealed	436	9
PURE-DR60-annealed	434	6
B1-DR20-annealed	421	7
B1-DR40-annealed	346	7
B1-DR60-annealed	234	4
B7.5-DR20-annealed	381	9
B7.5-DR40-annealed	266	4
B7.5-DR60-annealed	148	4
