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Enhancing Energy Harvesting Performance of PDMS based Piezocomposites via Synergy effect

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The finite element analysis was conducted to provide theoretical evidence on the mechanism of the enhanced piezoelectric effect in the 2-2 type PZN-PZT/MW-CNTs /PDMS with interconnected skeleton structure. For comparison, the analysis of 0-3 type PZN-PZT/PDMS with randomly-distributed particle was also performed.

Under the same external force conditions, the ice-templated 2-2 type composite shows higher applied net stress on the PZN-PZT element than the case of the 0-3 type counterpart. This larger induced stress would generate a stronger piezoelectric polarization, and as a result, stronger piezoelectric voltage response. The total piezoelectric field response in the 2-2 type composite is clearly higher than that of the 0-3 type composite, which agrees qualitatively with our experimental energy harvesting signals.

Ceramic material is set as PZT-5H in the material library in Comsol Multiphysics. The radius of ceramic particle is set to 2 μm.

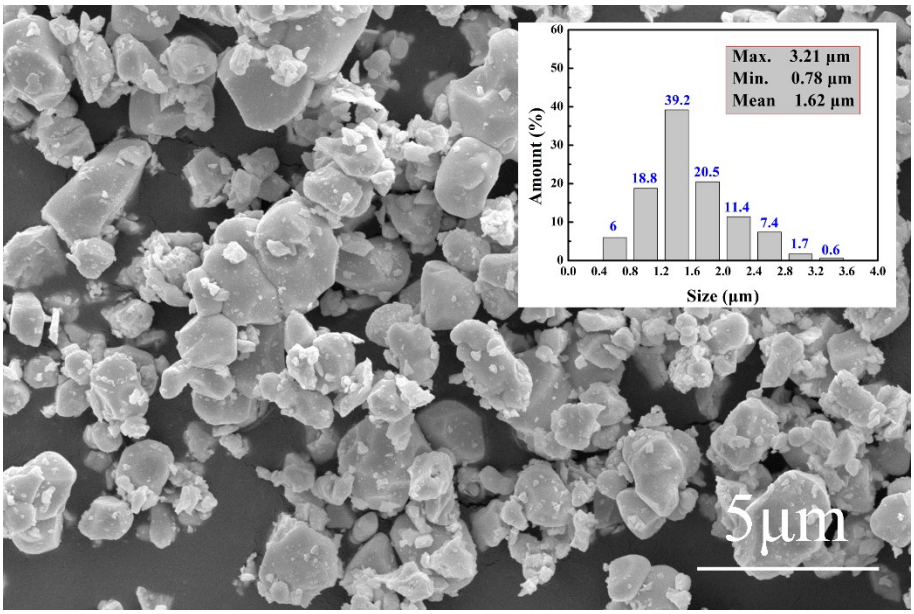

Figure S1. SEM image of PZN-PZT ceramic particles, the inset shows statistical results of particle size

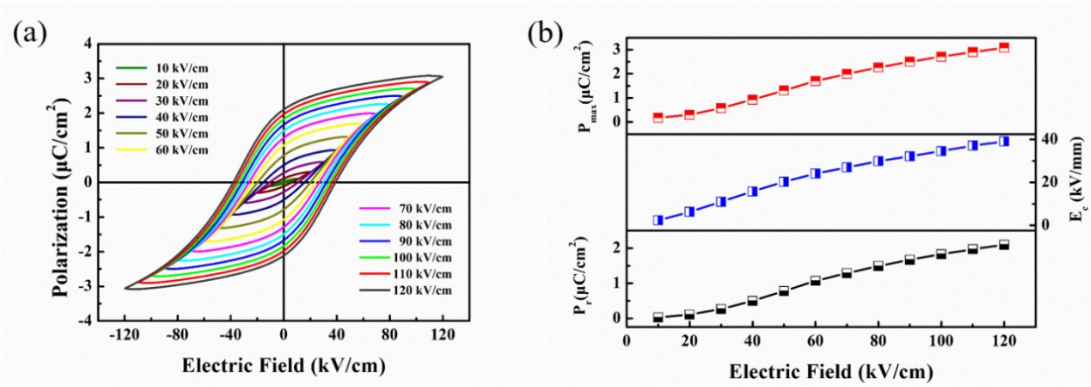

Figure S2. Hysteresis loops of PZN-PZT/PDMS composite with sintering under different electric field conditions, (b) P_{max}, E_c and P_r of composite under different electric field conditions

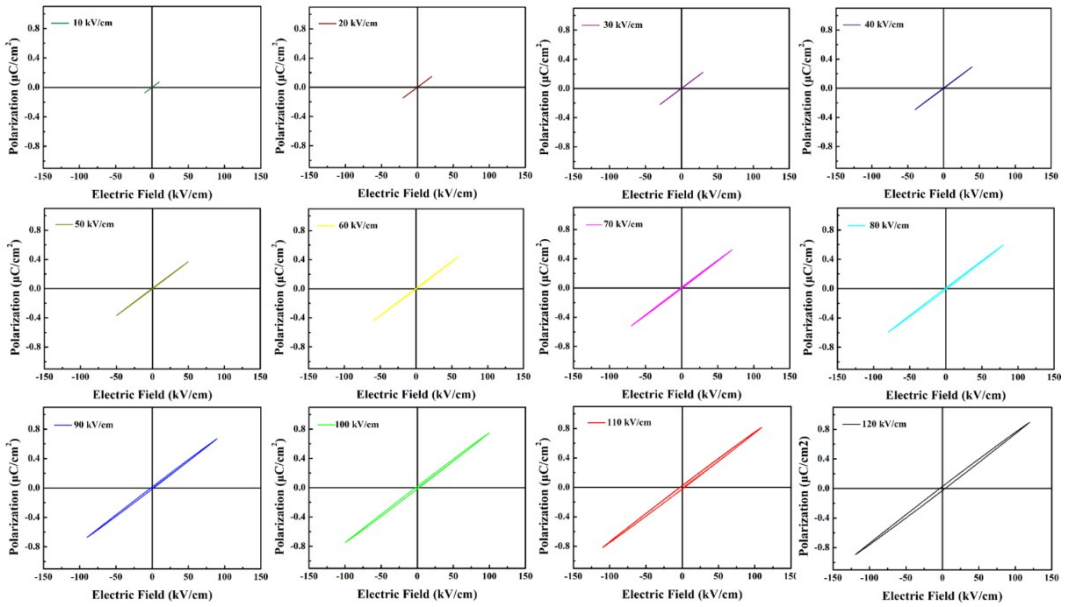

Figure S3. Hysteresis loops of PZN-PZT/PDMS composite without sintering under different electric field conditions