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Supporting Information

Enhancing output power density of piezocomposite nanogenerators through rational tuning of 3D interconnected skeleton structure

Hui Xu, Yudong Hou*, Xiaole Yu, Xin Gao, Mupeng Zheng, Mankang Zhu

Faculty of Materials and Manufacturing, Key Laboratory of Advanced Functional Materials, Education Ministry of China, Beijing University of Technology, Beijing 100124, China

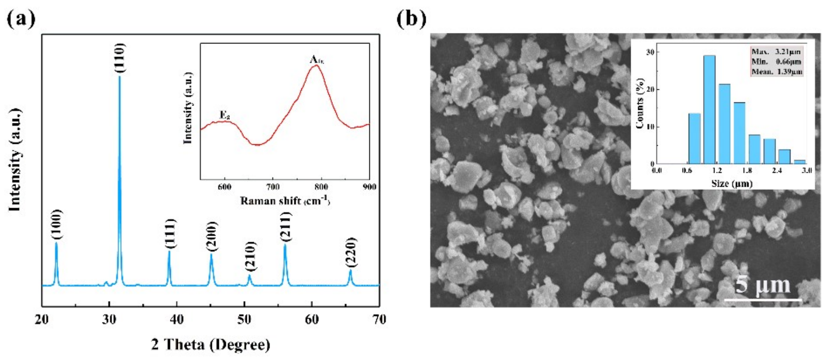

Figure S1. The characterization of the Sm-PMN-PT powder. (a) XRD pattern and Raman spectrum analyses (inset). (b) SEM image and the corresponding grain size distribution histograms (inset).

As shown in Fig. S1a, the X-ray diffraction (XRD) pattern confirms the perovskite structure of Sm-PMT-PT powder. In the inset of Fig. S1a, the Raman spectroscopy was measured to analyze the phase coexistence of the Sm-PMT-PT powder using a 532 nm Ar^+ laser as an excitation source. The frequency range of 700-900 cm^{-1} (called A_{1g} modes) was results from the polar nanoregions with the coexistence of the rhombohedral (R3*m*) and the tetragonal symmetry (P4*mm*). This means the coexistence of two different symmetrical phases, P4*mm* and R3*m*, in the PMT-PT system with the morphotropic phase boundary (MPB) composition. In order to determine the morphology and size of Sm-PMN-PT powder, the SEM test was carried out, and the average particle size was calculated by Nano Measurer software.

* Corresponding author. E-mail: ydhou@bjut.edu.cn

As shown in figure S1b, the Sm-PMT-PT particles prepared by the columbite precursor method have an irregular polyhedral shape and the average particle size is about 1.39 μm.

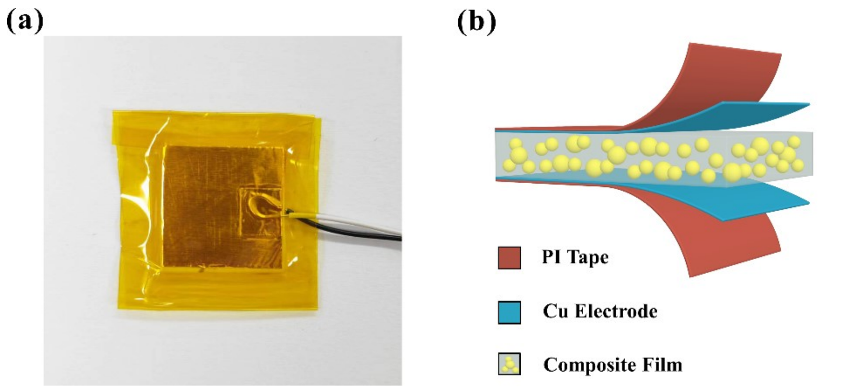

Fig.S2 (a) The optical image and (b) the schematic diagram of PENG

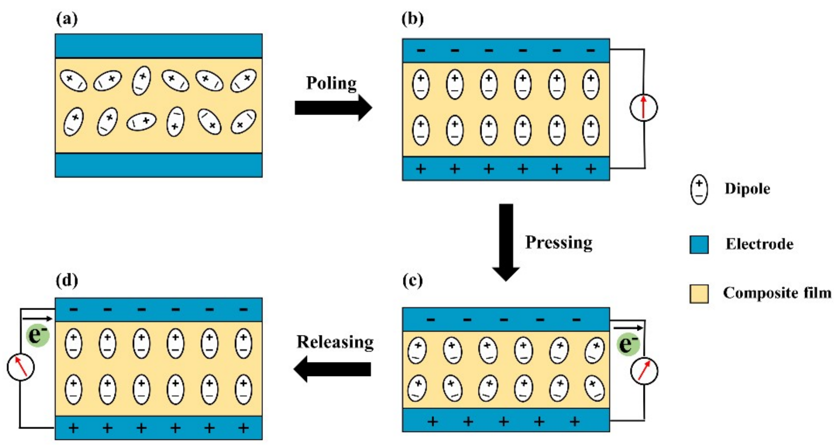

Fig.S3 The working mechanism of the PENG. (a) In the initial state before polarization, the electric dipoles are randomly oriented. (b) After polarization, the electric dipoles are oriented along the external electric field. (c) The electrical signal was generated in the closed circuit by applied external force. (d) Generate reverse electrical signal by releasing the force.