Improving Energy Storage Properties of PbHfO$_3$-Based Antiferroelectric Ceramics with Lower Phase Transition Fields

Yan Li, a Tongqing Yang a * and Xiaohui Liu a

a Key Laboratory of Advanced Civil Engineering Materials of the Ministry of Education, Functional Materials Research Laboratory, School of Materials Science and Engineering, Tongji University, 4800 Cao’an Road, Shanghai, 201804, China

E-Mail: Yangtongqing@tongji.edu.cn
Experimental section

The high-quality slurry was synthesized by mixing the second ball-milled PLHST matrix powders with solvent (toluene/ethanol), dispersant (phosphate ester), binder (polyvinyl butyral), plasticizer (polyethylene glycol-400/benzyl butyl phthalate) and homogenizer (cyclohexanone). After ball milling for 24h, the bubbles were removed from the slurry in a vacuum defoaming machine. The homogeneous slurry with good liquidity was cast on PET release film by using a tape casting machine. The wet films were kept for 12 h at room temperature for desiccation. The ceramic thick films were cut to square with a side length of 12 mm x 12 mm and the same thick films were pressed into square green bodies at 30 MPa and 70 °C by using a hot press mold. Finally, the samples were sintered to form ceramics. The thickness of testing sample is about 100 μm.

Fig. S1 A comparison of $W_{rec}$ and $\eta$ among this work and previously reported ceramics. PZ: PbZrO$_3$, PH: PbHfO$_3$, AN: AgNbO$_3$, NN: NaNbO$_3$. 