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The Role of Poling Protocol on Augmentation of Magnetoelectricity in BCZT/NZFO Layered Composites

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Abstract : We examined the exotic role of electrical poling of layered BCZT-NZFO bulk composite for sustainable advancement of magnetoelectric (ME) technology. Practically, it seems quite difficult to access the full potential of ME composites due to their weak ME coupling performances. Using a standard poling protocol, we successfully deployed the coupling performance of laminated ME composite, comprised of a ferroelectric (FE) layer of BCZT and a ferrite layer of NZFO. However, the ME coupling constant of laminated composite is optimized by lowering the volume fraction of the FE component to strengthen the mechanical strain in the piezoelectric layer while fixing the thickness of the magnetostrictive ferrite layer. Here, we employed systematic zero field cooled (ZFC) and field cooled (FC) electrical poling protocol on morphotropic phase boundary (MPB) based BCZT composition, well-appreciated for it's remarkable electromechanical activity. We report a record augmentation in magnetoelectric coupling as a consequence of a prudent field-cooled poling mechanism. On the basis of our findings, we emphasize that the degree of magnetoelectricity may be significantly improved for the miniaturization of efficient devices via proper execution of the poling technique.

Keywords : magnetoelectric, lead-free, ferroelctric, ferromagnetic, energy harvesting
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