Graded magnetostrictive nanoparticles for functional magnetoelectric composites

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Magnetoelectric (ME) effect is defined as an electrical polarization given by applied AC magnetic field, which is based on strain coupling effect between magnetostrictive and piezoelectric phases. So far, the ME composites have been spotlighted as various potential applications. However, reliable ME coefficient can be obtained under an optimal H_{dc} bias over several hundred Oersted, which is a serious drawback causing limitation of practical ME applications. In this respect, few studies have investigated self-bias ME effect in bulk ceramic systems, which is a remnant ME response induced by only AC magnetic field of 1 Oe at off-resonance frequency.

In this study, we have investigated ferromagnetic characteristics of graded magnetostrictive nanoparticles ($Co_xZn_{x-1}Fe_2O_4/CoFe_2O_4$) and ME responses of lead-free 3-0 composites ($Co_xZn_{x-1}Fe_2O_4/CoFe_2O_4$ - $BaTiO_3$). Further, graded thickness dependent built-in magnetic properties were found to exhibit how to optimize self-bias ME responses from particulate composites. This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2016R1C1B1010884).