Core-shell Structure Induced High Displacement in Piezoelectric Ceramics

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Abstract

Large strain is crucial for piezoelectric ceramics to be used as actuators. In this work, a piezoelectric composite with core-shell structure is proposed to pursue high strain at a low applied electric field. The core of the piezoelectric composite is typical ferroelectric material, while the shell is composed of non-ferroelectric material. The distribution of internal electric field and the displacement are both simulated through a finite element method (FEM). The effect of shell volume fraction, dielectric permittivity and elasticity modulus on the displacement of piezoelectric composites are respectively studied through this model. Results indicate that the displacement of piezoelectric composites can be enhanced by adopting smaller shell volume fraction, or by increasing the shell permittivity or decreasing shell Young's modulus.

Figures used in the abstract

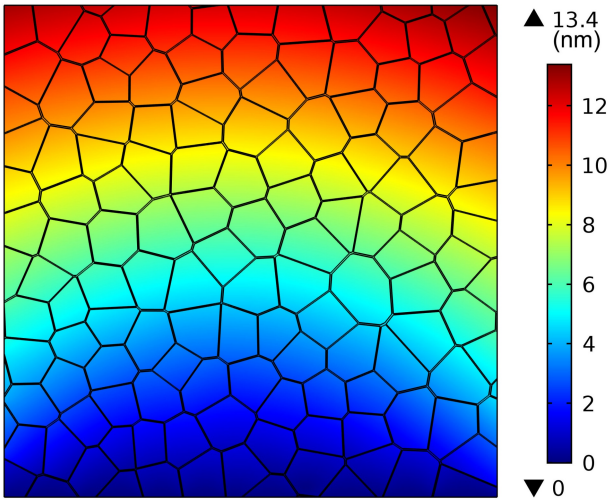

Figure 1: Displacement field distribution of piezoelectric composite under the applied electric field (E) of 2 kV/mm.