A two-scale homogenization procedure for electromechanically coupled ceramics

Prof. Jörg Schröder

Institute of Mechanics, Department of Civil Engineering
University of Duisburg-Essen

Ferroelectric materials exhibit a spontaneous polarization, which can be reversed by an applied electric field of sufficient magnitude. The resulting nonlinearities are expressed by characteristic dielectric and buttery hysteresis loops. These effects are correlated to the structure of the crystal and especially to the axis of the spontaneous polarization in case of single crystals.

On our representative meso scale we assume that the domains consist of unit cells with equal spontaneous polarization. Each domain is modeled within a coordinate invariant formulation for an assumed transversely isotropic material as presented in [2], in this context see also [1]. In this investigation the macroscopic polycrystalline quantities are obtained via a simple homogenization procedure, where discrete orientation distribution functions are used to approximate the different domains.