„Computational Modelling of Interfacial Fatigue Effects in Grain Boundaries of Functional Ceramics“

Ferroelectric materials offer a variety of new applications in the field of smart structures and intelligent systems. Accordingly, the modelling of these materials constitutes an active field of research. A critical limitation of the performance of such materials is given when electrical, mechanical, or mixed loading fatigue occurs. In this contribution, fatigue effects in ferroelectric materials are numerically investigated by utilisation of a cohesive-type approach. In view of Finite-Element-based simulations, the geometry of a natural grain structure, as observed on the so-called micro-level, is represented by an appropriate mesh. While the response on the grains themselves is approximated by coupled continuum elements, grain boundaries are numerically incorporated via so-called cohesive-type elements. These offer a great potential for numerical simulations: as an advantage, they do not result in bad-conditioned systems of equations as compared with the application of standard continuum elements to localised deformations. Being endowed with appropriate cohesive-type constitutive laws in order to capture the grain boundary behaviour phenomenologically, the grain boundaries are identified as a main issue in the fatigue context. Subsequent to a demonstration of the numerical framework, studies of benchmark boundary value problems with fatigue-motivated boundary conditions are presented.

Alle Interessenten sind hierzu herzlich eingeladen.

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