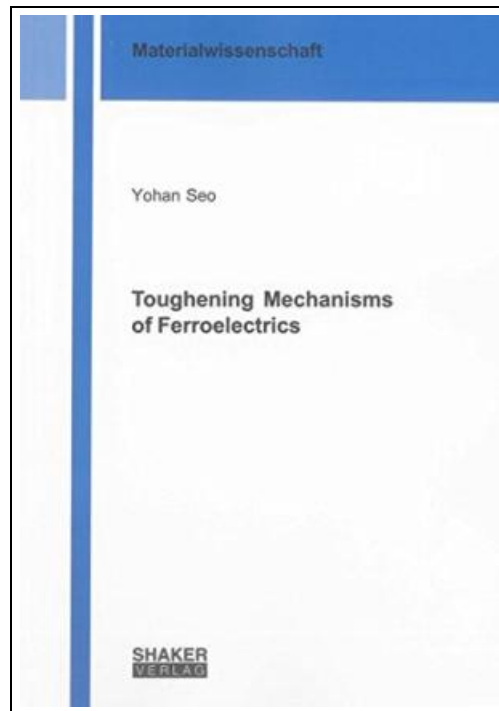


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Shaker Verlag Okt 2013, 2013. Buch. Condition: Neu. Neuware - Despite the polycrystalline nature, piezoelectricity can be observed in ferroelectric ceramics after the electrical poling, which aligns domains along the direction of external electric field. Due to piezoelectricity, ferroelectric ceramics have been used for a variety of devices such as actuators, sensors, and transducers. In order to ensure long term reliability, it is required to understand crack growth-related fracture behavior under mechanical load. To this end, in the present work, the influence of crystal structure as well as second phase inclusion on fracture behavior of ferroelectric ceramics has been investigated. Ferroelasticity plays an important role during fracture of ferroelectric ceramics, such as PZT. Prior to examining the fracture behavior, the macroscopic stress-strain behavior as a function of PZ/PT ratio and temperature were investigated to provide an insight into ferroelasticity of PZT in the thermal operating range of many actuators. In conjunction with an X-ray diffraction (XRD) analysis, temperature- and composition-dependent ferroelastic responses are discussed in terms of the change in lattice structure. It was found that the ferroelastic characteristics, such as the coercive stress and remanent strain, were closely correlated to the lattice distortion. With decreasing lattice distortion, found either by modifying the PZ/PT ratio or the temperature, a decrease of coercive stress was observed. At elevated temperature, a decrease in remanent strain due to the reduced lattice distortion was found. This was, however, not the case for compositional changes in lattice distortion. The abnormal increase in was observed in rhombohedral compositions, which is likely due to either a change of lattice parameters or stress induced R T phase transition. Soft PZT ceramics were found to display the R-curve behavior regardless of changes in composition or temperature. MPB compositions of PZT showed a larger ferroelastic toughening, which is attributed to...

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