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Domain switching studies in ferroelectrics using X-ray and neutron diffraction

In ferroelectric materials, extrinsic contributions such as domain wall vibrations, domain switching, and interphase boundary motion contribute to fatigue and aging, nonlinearity and hysteresis in the piezoelectric response, affect the deformation behavior, and influence the fracture mechanics. The most prevalent extrinsic contribution is ferroelectric/ferroelastic domain switching. Recent advances in diffraction techniques offer many opportunities for novel characterization of domain switching and its influence on macroscopic behavior. This talk presents the results of such techniques used to characterize extrinsic mechanisms *in situ* in soft lead zirconate titanate (PZT) ceramics. In one example, stroboscopic, time-resolved neutron diffraction is used to measure ferroelectric/ferroelastic domain switching and lattice strains during high-frequency electric-field drive. At such conditions, extrinsic mechanisms contribute up to 30-40% of the macroscopic piezoelectric response. In a second example, high-energy X-ray microdiffraction is used to measure the spatial distribution of ferroelastic domain switching around crack tips. Under an applied stress intensity factor of KI=0.71 MPa·m1/2 and just below the initiation toughness, in-plane domain switching near the crack tip is found to be directionally-dependent, correlating with deviatoric, mode I elastic stress distributions, and exhibits a process zone height greater than 1 mm.

Die Vorträge finden, wenn nicht anders angegeben, jeweils um **16:15** im Gebäude der Materialwissenschaften, Lichtwiese, Petersenstr. 23, **Raum 77** statt