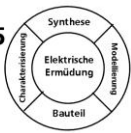


SFB 595



Deutsche  
Forschungsgemeinschaft

DFG

## Sonderforschungsbereich 595 Elektrische Ermüdung in Funktionswerkstoffen



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

*Kolloquium im  
SOMMERSEMESTER 2011*

**07.06.  
2011**

**Prof. Dragan Damjanovic**  
Ceramics Laboratory, Swiss Federal  
Institute of Technology – EPFL, Lausanne

### **Origins of electro-mechanical coupling: morphotropic phase boundary**

The presentation will start with a brief introduction into electro-mechanical coupling. It will be shown that nearly all present attempts to improve electro-mechanical properties of ferroelectric materials are based either on controlling motion and structure of domain walls or on exploiting different kinds of instabilities in materials. This presentation will focus on the latter. The morphotropic phase boundary (MPB) and associated instabilities induced by compositional variation are discussed in detail. The MPB is arguably the most important and the least understood phenomenon in piezoelectric materials. Several mechanisms have been proposed as origins of the high properties at MPB: facilitated switching of domain walls and thus easy poling of polycrystalline materials; coexistence of two phases separated by a low energy barrier; hierarchical domain wall structure; and, most recently, the facilitated polarization rotation via monoclinic phases such as those recently discovered in several ferroelectric solid solutions. The presentation will give an overview of these interpretations and will discuss in detail the polarization rotation mechanism – what does it mean, how does it explain the large properties, whether it is the only mechanism of properties enhancement in solid solutions, how is it related to structural instabilities, and whether a monoclinic phase itself is essential for enhanced properties. Alternative ways to obtain enhanced properties in regions of compositionally induced structural instabilities will be discussed.

Die Vortrag findet um **16:15 Uhr** im Gebäude der Materialwissenschaften, Lichtwiese, Petersenstr. 23, **Raum 228**, statt.