SFB 595 Deutsche Forschungsgemeinschaft DFG

# Sonderforschungsbereich 595

**Elektrische Ermüdung in Funktionswerkstoffen**

TECHNISCHE UNIVERSITÄT DARMSTADT

*Kolloquium Sommersemester 2012*

**26.04. 2012**


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## Morphotropic phase boundary for piezoelectricity: make it or break it


Piezoelectric materials, which enable the conversion between mechanical and electrical energies, are crucial in numerous applications including energy harvesting, medical imaging, and minimally invasive surgery. Superior piezoelectricity emerges at the morphotropic phase boundary (MPB), where multiple ferroelectric phases coexist. The basic rule for developing high-performance piezoelectrics, which has been closely followed since 1950s, is to identify ferroelectric compositions at MPBs, and then pole them with strongest possible electric fields. Our *in-situ* transmission electron microscopy observations and piezoelectricity measurements on $(Bi_{1/2}Na_{1/2})TiO_3$–$BaTiO_3$ ceramics indicate that this long-standing guiding rule is questionable. We demonstrate that poling fields can either destroy or create MPBs and the associated strong piezoelectric property. Therefore, even the previously ignored single-phase materials could exhibit superior piezoelectricity if stable MPBs form during poling. Such fundamental alterations to the universal guideline add a new dimension to the development of next generation high-performance piezoelectrics.


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

Darmstadt, 28.02.2012