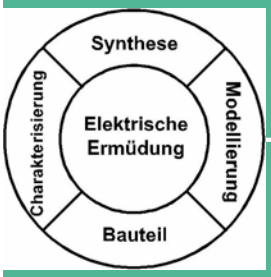


# Sonderforschungsbereich 595

**Elektrische Ermüdung in Funktionswerkstoffen**

TECHNISCHE UNIVERSITÄT DARMSTADT

*Kolloquium WINTERSEMESTER 2009/2010*

05.11.
2009

## Prof. Andrzej Molak

University of Silesia, Katowice

## Electric current relaxation related to defects and non-homogeneity in several sodium niobate-based and Mn-doped perovskites

The presentation is focused on macro- and micro-scale electrical properties of the perovskite compounds based on $NaNbO_3$ doped with Mn ions. $NaNbO_3$, $NaNbO_3$:Mn, $(BiNa)(MnNb)O_3$, $Pb(MnNb)O_3$ as well as $KNbO_3$ crystals and ceramics have been studied. The chemical and structural characterisation carried out with XRD, XPS, SEM, and AFM tests enables us to show the non-homogeneous features of these materials. The defects level has been changed in the samples by thermal treatment at various oxygen partial pressures.

The depolarisation current curves served to estimate the space charge concentration and the macroscopic relaxation times.

The localized electric conductance has been analysed using the electric modulus representation. Characteristic times of the electric conduction relaxation have been evaluated. Dispersive features of electric conduction and electric permittivity are ascribed to defects occurrence. Oxygen vacancies and migration of ions resulting from the applied chemical gradient and electrical gradient have been detected.

The electric conduction of the ceramics exhibits thermally activated dependence related to mixed polaronic and ionic conductance in high temperature range. The Fermi glass features occur in low temperature range that enables us to estimate the density of states.

The axial pressure effect converges to the clamping pressure known from the ferroelectric domain structure model. Influence of hydrostatic pressure on the electric conduction dynamics and Gate model proposed to describe these effects are discussed.

The electroformation-induced macro- and micro-scale properties of the transition from insulator to metallic-type conduction in sodium niobate are reported. The results are interpreted as electromigration effects. The nano-scale non-homogeneous spatial distribution in conductance has been determined using the AFM test.

The concentration of electric charges available for conduction, estimated for the studied materials, are shown.

Die Vortrag findet um **16:00** im Gebäude der Materialwissenschaften, Lichtwiese, Petersenstr. 23, **Raum 77** statt

Darmstadt, 30.10.2009