

DF 7: Invited Talk - Thorsten Granzow

Time: Tuesday 12:00–12:45

Location: GER 37

Invited Talk

DF 7.1 Tue 12:00 GER 37

Defects in functional polar oxide materials - Detection and influence on electrical properties — •TORSTEN GRANZOW¹, NINA BALKE², JULIA GLAUM³, and SILKE SCHAAB⁴ — ¹CRP - Gabriel Lippmann, Belvaux, Luxembourg — ²ORNL, Oak Ridge, USA — ³UNSW, Sydney, Australia — ⁴TU Darmstadt, Darmstadt, Germany

All properties of functional polar oxide materials are critically influenced by defects, both charged and uncharged, in the crystal structure. This gives the possibility to systematically tune properties relevant for application by doping, but also carries the risk of deteriorating performance under different conditions. This presentation takes a look at both sides. It first addresses the question of electrical fatigue and aging in bulk piezoelectric ceramics on the example of doped lead zirconate

titanate (PZT). A comparison of large- and small-signal properties shows phenomenological similarities between fatigue - deterioration of properties under cyclic electric loading - and aging - deterioration with time without load. It is shown in how far both effects can be explained by the same cause, migration of charge carriers to grain boundaries. After that, the possibilities to influence phase stability and relaxor behavior in lanthanum-modified lead zirconate titanate (PLZT) are investigated. Here, the defects are modified by annealing in different reducing atmospheres. A combination of optical and electrical measurements reveals that the final defect structure and the resulting electrical properties depend on the type of reducing agent just as much as on the oxygen partial pressure. The results are discussed and contrasted to commonly used relaxor models.