KR 3: Ceramics and Applications (DF, KR)

Time: Thursday 15:00–15:40 Location: H26

KR 3.1 Thu 15:00 H26

Crystallization in luminescent borate glass for use in white LEDs — •A. Charlotte Rimbach[1], Franziska Steudel[2], and Stefan Schweizer[1,2] — [1]South Westphalia University of Applied Sciences, Luebecker Ring~2, 59494 Soest — [2]Fraunhofer Application Center for Inorganic Phosphors, Branch Lab of Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Luebecker Ring~2, 59494 Soest

The majority of white LEDs is comprised of a blue light emitting diode and a yellow phosphor. The phosphor powder, which converts a part of the blue light to yellow light, is embedded in an organic polymer and directly coated onto the LED chip. Heat-induced degradation of the polymer-based encapsulate, however, results in an efficiency decrease and color temperature change. Luminescent glasses and glass ceramics might represent an interesting alternative due to their higher thermal and chemical stability. For optical activation, the glasses are doped with rare-earth ions such as europium and terbium. Due to the relatively low absorption coefficient of the rare-earths the blue LED light is only absorbed by a small amount resulting in a too high color temperature. To increase the optical absorption by multiple scattering and reflection the glasses are subsequently processed to glass ceramics. This work focuses on the crystallization process in europium-doped lithium-aluminium-borate glass upon annealing at different temperatures for different periods of time. Differential scanning calorimetry and X-ray diffraction are the methods chosen to monitor the crystal growth and to identify the crystal phases.

KR 3.2 Thu 15:20 H26

Small-scale Dislocation Plasticity in Strontium Titanate — •Alexander Stukowski, Farhan Javaid, Karsten Durst, and Karsten Albe — Technische Universität Darmstadt

Strontium titanate (STO) is an optically transparent perovskite oxide ceramic material. In contrast to other ceramics, single crystal STO plastically deforms under ambient condition, without showing a phase transition or early fracture. This remarkable ductility makes it a prime candidate for different technological applications. However, while the mechanical behavior of bulk STO has been studied extensively using uniaxial compression testing techniques, little is known about the local, small-scale behavior and the details of dislocation-based nanoplasticity in this perovskite material.

In this contribution we compare results obtained from new nanoindentation experiments and corresponding large-scale molecular dynamics simulations. The evolution of the plastic zone and dislocation structures that form underneath the indenter is investigated using etch-pit methods in experiments and a novel three-dimensional defect identification technique in atomistic computer models. The latter allows tracing the evolution of the complete dislocation line network as function of indentation depth, quantifying the activity of different slip systems, and correlating this information with the recorded load-displacement curves and hardness data.