

Oxide and metal thin films for model-type experiments in solid state ionics

Jürgen Janek

Justus-Liebig-Universität Gießen, Physikalisch-Chemisches Institut
Heinrich-Buff-Ring 58, 35392 Gießen, Germany

Pulsed laser deposition is a highly flexible technique for the preparation of small area thin films of almost any material (which absorbs enough energy during laser irradiation). We use the PLD technique in a wide range of projects for the preparation of solid electrolyte thin films, epitaxial metal electrodes on solid electrolytes or metastable phases with a wide phase range.

In my presentation I will present different examples for the beneficial use of PLD, its advantages and its shortcomings:

- a) Nanoscaled solid electrolyte multilayers: Multilayers of Zr-based solid electrolytes (used in SOFC) and a second insulating phase are ideal model systems for the study of fast transport along interfaces. The specific microstructure of PLD films leads to interesting effects for the atomic transport. Both ionic conductivity and ^{18}O diffusion along the interfaces have been studied and interpreted.
- b) Lithium-conducting solid electrolyte thin films: Li-ion conducting thin films or membranes are considered as key components for certain types of lithium-based batteries. We were successful in preparing garnet-type thin films with high lithium ion conductivity.
- c) Epitaxial thin film metal electrodes on solid electrolytes: For the construction of μ -SOFC with operation temperatures much below the current state of technology microstructured Pt electrodes on single crystalline YSZ are also an ideal model system. The correlation between microstructure and kinetic properties will be discussed.