UNIVERSITÄT LEIPZIG

Faculty of Physics and Earth System Sciences
Prof. Dr. I. Sodemann
Prof. Dr. K. Taute

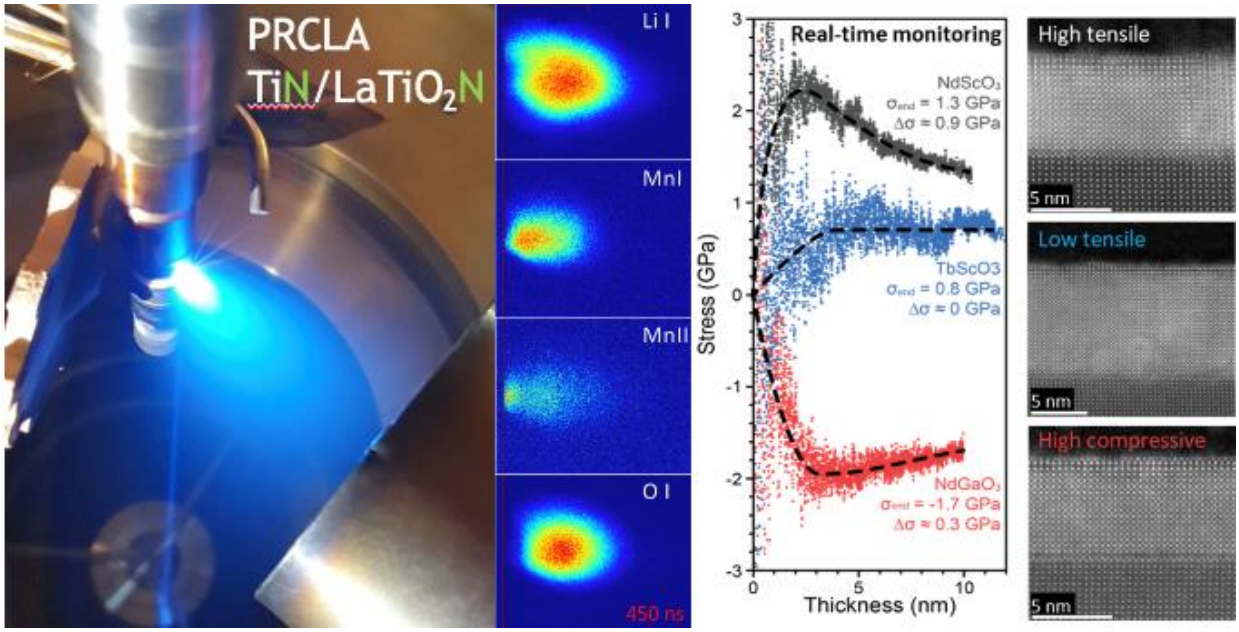
Special Physics Colloquium in honor of Prof. Dr. Michael Lorenz

Tuesday, 5 November 2024 at 16:30

Prof. Dr. Thomas Lippert

Paul Scherrer Institut, ETH Zürich, Schweiz

Pulsed Laser Deposition (PLD) of Oxide Materials: From Fundamental Aspects to Sample Preparation for Energy Materials



Thin films of organic, polymeric, biological, and inorganic thin films are utilized in many applications, e.g. catalysis, microelectronics, sensors, food industry, tools, optics, decorative coatings, and renewable energy applications, etc. The preparation of these thin films can be achieved with a variety of tools e.g. pulsed laser deposition (PLD). PLD can be divided into 3 steps, i.e. laser ablation and plasma formation, plasma expansion, and film growth. It is noteworthy, that it is often assumed, without further analysis, that the films will have automatically the same composition as the target, which is not really the case. I will show

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that all steps and the associated parameter, such as background gas type and pressure, target composition, and substrate type and temperature have a pronounced effect on the PLD process, and therefore on the film composition and properties.

A detailed knowledge of these possible problems allows us to use PLD as "simple" preparation technique for thin films samples of materials that can be classified as energy materials. These materials are important for research in the field of renewable energies, with a focus on fundamental studies using large facilities of PSI, such as the Swiss Light Source (SLS, synchrotron) and the Swiss Spallation Neutron Source (SINQ). This will be shown for materials that can be applied for water splitting, i.e. oxynitrides, where we study the degradation mechanisms of these materials with operando grazing incidence X-ray absorption spectroscopy and neutron reflectometry. For both techniques high quality thin films are a mandatory requirement. Other examples are strain engineering with in-situ measurements of the strain in the growing thin films, to enhance ionic conductivities in thin films, while for a more applied example, PLD is used for the preparation of an all-solid state thin film Li-ion battery. Finally, an outlook for PLD as fundamental research tool at PSI will be given.

Host: Dr. Holger von Wenckstern

Venue: Universität Leipzig, Faculty of Physics and Earth Sciences
04103 Leipzig, Linnéstraße 5, Small Lecture Hall

After the lecture, all attendees are invited to a reception in the Aula.