Seminar

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Wednesday, 24th July, 09:00 s.t.
TU Wien, Getreidmarkt Campus
Building BC, Ground Floor, Seminar Room BC EG A36
https://tuw-maps.tuwien.ac.at/?q=BCEGA36

The seminar will also be held as a Zoom Meeting
https://tuwien.zoom.us/j/69670054576?pwd=JvX8dkGeO8R0kgIQcWxYxvskUopbjk.1
Meeting ID: 696 7005 4576
Password: a2H8YbgcAm

Surface Sensitive and In-Situ Characterization of Perovskite Materials for Energy Conversion: Optimizing Material Design

Developing new energy conversion technologies is a major scientific challenge to tackle global warming and energy demand. Perovskite-type materials are important as they provide electron and/or ion conductivity, which is key in energy-related applications, such as photovoltaics, fuel cells, and electrolysis cells. Lead halide perovskites (LHPs), with the formula $APbX_3$, have been used as absorber layers in low-cost solar cells. Perovskite oxides, with the formula ABO_3, have been used as electrodes and catalysts in electrochemical applications. However, the perovskite crystal structure can be unstable and transform into other phases under different external stressors. First, this talk addresses the challenges associated with the instability of LHPs exposed to humidity and low temperatures, by investigating the complex relationship between structure, properties, and performance in LHPs for solar cells. Second, I will discuss about the high temperature reduction of perovskite oxides (e.g., $La_{0.5}Sr_{0.5}Ti_{0.94}Ni_{0.06}O_3$), which leads to the formation of embedded nanoparticles through a process known as exsolution. Nickel nanoparticles can serve as catalysts for electrochemical reactions relevant to energy conversion and storage systems. My work utilizes advanced synchrotron-based in-situ techniques, such as grazing-incidence wide-angle and small-angle X-ray scattering (GIWAXS/GISAXS) and X-ray photoelectron spectroscopy (XPS), to examine the structural and chemical properties at the surface of these perovskites. Understanding the mechanisms of perovskite phase transformations and establishing correlations between structure, chemistry, and properties will enable the tuning and optimization of these materials to make them more robust, stable, and efficient for real-world energy-related applications.

All interested colleagues are welcome to this seminar lecture
(45 min. presentation followed by discussion).

Günther Rupprechter
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André Vogel
Coordinator