

Perovskites for Photovoltaics

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Lead-halide perovskites are becoming a great player in solar energy and light-based technologies. Their ability to convert light into electricity keeps improving, even reaching levels similar to established, high-quality materials like single-crystal semiconductors. However, further performance improvement requires reducing defect-assisted, nonradiative recombination of charge carriers in the perovskite layers. A deeper understanding of perovskite formation and associated process control is a prerequisite for effective defect reduction.

In this seminar, a combination of techniques used for studying the structural and optoelectronic kinetics during the perovskite formation will be presented, including in-situ photoluminescence (PL) spectroscopy and grazing-incidence small/wide-angle X-ray scattering (GI-SAXS/WAXS). The obtained growth kinetics for vapor-deposited perovskites, as well as for perovskite layers fabricated from the wet phase, will be described. The results reveal the formation of lead-halide perovskite films from the early stages and uncover the morphology, crystallographic structure, and defect density evolution.