DS 4: Thin film photovoltaics

Time: Monday 9:30–10:00 Location: H 2032

Invited Talk DS 4.1 Mon 9:30 H 2032

The role of defects in thin film solar cells — •Thomas Unold — Helmholtz-Zentrum Berlin, Institut für Technologie

Thin film solar cells are an attractive technological option for electricitiy production, because they require only very little active material, compared to conventional crystalline silicon wafer-based solar cells, and because they can be directly deposited on large areas by a variety of vacuum-based or also non-vacuum based processing techniques. In order to achieve conversion efficiencies comparable to crystalline silicon solar cells, the reduction of defects and therefore minority carrier recombination are critical issues. We will show that zero-dimensional defects (point defects), one-dimensional defects (dislocations) and two-dimensional defects (grain boundaries) play different roles in the different adamantine thin film absorber materials silicon, CdTe and chalcopyrites. In particular the chalcopyrite-type semiconductor Cu(In,Ga)Se2 has been found to be extremely tolerant to deviation from stoichiometry, with minority carrier lifetimes up to 300ns for material compositions where structural defects in the percent range are expected. This can be explained with the formation of electronically benign secondary phases and the absence of deep levels in optimized material, leading to low recombination activities of point-defects, dislocations and grain boundaries in this material.