Kolloquium Energie- und Halbleiterforschung

Universität Oldenburg
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Abteilung Energie- und
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Why controlling the gas – solid interface during compound semiconductor synthesis is important for composition and extrinsic doping

Photovoltaic modules in combination with the sun provide a source of renewable energy that could potentially be sufficient to provide all the worlds needs. Currently modules are based on silicon solar cell technology, but alternative thin film technologies can be made with similar efficiencies and lower energy cost. These thin film solar cells are based on p-n junctions consisting of compound semiconductors such as Cu(In,Ga)Se2 and these have achieved light to electric power conversion efficiencies of 22.6 % in the laboratory. Two challenges remain for these solar cells. One is to reduce still further the production cost, and the other is to understand the role of extrinsic dopants. In the first part of the talk a radical approach to reducing energy cost during semiconductor synthesis will be introduced, namely Laser annealing. In the second part of the talk, a new doping channel is revealed which could explain the difficulty in interpreting the role of extrinsic dopants commonly found in the literature. The new doping channel is also of importance to other compound semiconductors. Key to both topics is the vapour - solid interface during compound semiconductor growth.

[1] Deliberate and Accidental Gas-Phase Alkali Doping of Chalcogenide Semiconductors: Cu(In,Ga)Se2, Scientific RepoRts | 7:43266 | DOI: 10.1038/srep43266 1
[2] Laser Annealing of Electrodeposited CuInSe2 Semiconductor Precursors: Experiment and Modeling, Journal of Materials Chemistry C, 2017, 5, 1336 – 1345