Universität Oldenburg
Institut für Physik
Abteilung Energie- und
Halbleiterforschung

The research field of the Laboratory for Chalcogenide Photovoltaics (LCP) of the department of Energy and Semiconductor Research (EHF) of the Institute of Physics at the Carl-von-Ossietzky University of Oldenburg offers a master thesis for students of the subjects physics and engineering physics with the title

Recombination dynamics in $CuIn_xGa_{1-x}Se_2$ thin film solar cells under additional illumination.

One of the most essential characteristics of a semiconducting component (e.g. a solar cell) is the way, in which excited charge carriers recombine in that component. Both the recombination channels and the recombination dynamics are characteristic. The Time Resolved Photoluminescence Method (TRPL) offers a possibility to analyze these aspects of the cell by measuring the decay of its luminescent radiation after it has been excited with a short laser pulse. The greatest challenge in the interpretation of the measured PL-decay is to recognize the possible contributions of different recombination mechanisms to this decay. One main contribution probably originates from defect states in the band gap (so-called "traps") which trap the excited electrons and re-emit them into the conduction band after a while; this mechanism increases the PL decay time.

Tasks:

For this Master Theses the recombination dynamics of $CuIn_xGa_{1-x}Se_2$-thin-film-solar-cells should be measured using the TRPL method with an additional illumination (light bias). The additional light can fill the traps and influence the PL decay. This method allows it to identify the contributions to the PL-decay which stem from trapping and reemission of electrons.
Furthermore the illuminated situation is much closer to the normal usage of a solar cell, so that the experiments can give a more realistic picture of the recombination dynamics in solar cells.

The first phase of this work is to characterize the white light laser source and integrate it to the existing measurement setup. In the second phase follow the PL-measurements with light bias of different spectral compositions. PL measurements will be done both spectrally and time resolved.

For further information please contact:

Dr. Stephan Heise
Stephan.Heise@uni-oldenburg.de
Tel.: 0441 798- 3008

M.Sc. Fabio Lopez
jose.fabio.lopez.salas@uni-oldenburg.de
Tel.: 0441 798-3894