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

Wavelength dependent photoluminescence measurement under excitation by a white light laser source

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.

For this Master Theses the recombination dynamics of $CuIn_xGa_{1-x}Se_2$-thin-film-solar-cells should be measured under variation of the excitation wavelength using the TRPL-Method. By changing the excitation wavelength the penetration depth of the radiation can be changed, which also changes the spatial distribution of the excited charge carriers. This method allows it to identify the contributions to the PL-decay which come from the redistribution of the excess charge carrier concentration created by the pulse.

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 come the PL-measurements with variation of the excitation wavelength. The measurement of the photoluminescence should be done both in the spectral and in the time domain.

Moreover, the measurements should be done on solar cells with a ZnO transparent electrode as well as on systems without this uppermost layer. This will help recognize the influence of charge separation at the multi-junction.

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