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Bachelor/Master Thesis

Laser Beam Induced Current Measurements

Objective

The rapid increase of the conversion efficiency of perovskite solar cells due to their enormous potential provides a very promising possibility to improve the efficiency of various solar modules significantly to potentially over 35%. For an efficient extraction of the charge carriers, interconnection lines of thin-film solar modules are necessary. However, they reduce the active area of the solar modules and thus lower their overall efficiency.
Laser-scribing of interconnection lines of Perovskite thin-film solar modules has already been demonstrated to be a promising technique for high accuracy low-cost interconnection fabrication. Nevertheless, it raises new challenges regarding ablation mechanism, debris redeposition and degradation due to heat. Therefore, a laser beam induced current (LBIC) measurement setup is envisaged to provide detailed information about the local current generation of laser-scribed perovskite solar modules.

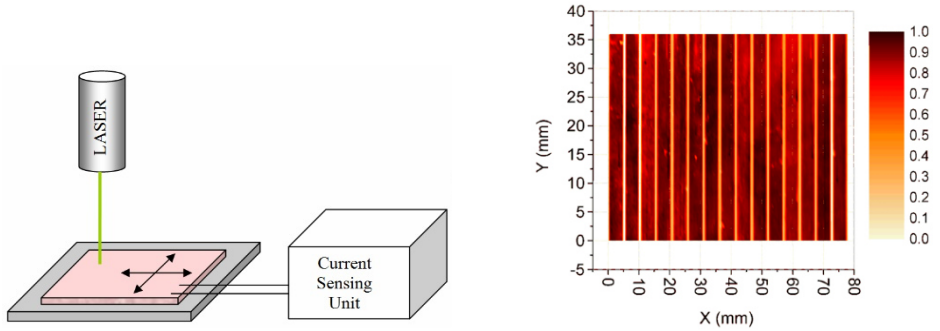

Figure 1: (Left) Schematic of a laser beam induced current measurement setup [1] and (right) exemplary representation of the normalized current generation of a solar module [2]

The scope of work includes the installation of necessary LBIC setup components, creation of a setup control program (LabVIEW) including a clear UI and the validation of the setup's functionality. The work concludes with a subsequent experimental study of dead areas on self-made laser-scribed perovskite modules. The facilities of the Institute of Microstructure Technology will provide a perfect environment for insights in interdisciplinary work between physics, mechanical and electrical engineering. The candidate will get the opportunity to work in a young and highly motivated international team and will get precious experience.

Prerequisites

We are looking for a candidate with a strong affinity for development and experimental work. In addition, a fundamental understanding of refractive optics is indispensable. The ideal candidate should have a strong drive to engage with research activity that often implies addressing novel challenges. Prior experience with LabVIEW as well as lab experience will be advantageous. This is a multidisciplinary project, so a will to broaden horizons and strengthen a diverse set of skills is also desirable.

[1] https://www.tu-ilmenau.de/de/techphys1/team-solution-processed-photovoltaics/equipment/light-beam-induced-current/
[2] F. Matteocci *et al.*, "Fabrication and Morphological Characterization of High-Efficiency Blade-Coated Perovskite Solar Modules," 2019.

Research Group
"Advanced Optics and Materials for Next Generation Photovoltaics" of IMT / LTI

Research areas
Solar Energy, Nano-photonics, Micro and Nanosystems

Places
IMT (KIT, Campus North)
LTI (KIT, Campus South)

Focus
Development, Validation, Characterization

Study path
Physics or
Optics & Photonics or
Electrical/Mechanical engineering

Application period
Spring 2020 / Earlier

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