

## PHYSICAL COLLOQUIUM

### INVITATION

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Monday, 28.01.2019, 4.15 p.m., W2-1-148

speaks

**Prof. Dr. Clemens Heske**

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about

**“Characterization of surfaces and interfaces in solar devices -  
magic treatments, alternative buffers, and what  
they do to the electronic structure”**

Among the various technologies for thin-film solar cells, Cu(In,Ga)(S,Se)<sub>2</sub>- (CIGSSe-) and CdTe-based systems rank prominently, having reached conversion efficiencies well above 20%. At first glance, then, one would think that “we are done”. However, the opposite is true: much remains to be understood and optimized, in particular when “magic” treatments or alternative (buffer) materials are to be employed.

Using a tool chest of electron and soft x-ray spectroscopic methods, it is possible to unravel (some of) the secrets of magic treatments, alternative buffers, and their interfaces with the various solar cell absorber materials. This tool chest includes lab-based photoelectron spectroscopy with x-ray and UV excitation (XPS and UPS, respectively), inverse photoelectron spectroscopy (IPES), and x-ray-excited Auger electron spectroscopy (XAES). These techniques are complemented by soft x-ray emission (XES) and absorption (XAS) spectroscopy using high-brilliance synchrotron radiation. While the electron-based techniques are very surface-sensitive, XES and XAS are photon-in-photon-out techniques that probe the bulk region near the surface.

In the talk, experiments to gain insights into the impact of magic treatments, alternative buffer materials, and their absorber interfaces will be presented, in particular in view of band alignment, intermixing behavior, and, ultimately, their device performance. And while the main focus will be on specific thin-film solar cell materials, attempts will be made to convince the esteemed listeners that these characterization techniques can be applied to a wide variety of different materials and their surfaces/interfaces.

All interested persons are cordially invited.  
Sgd. Dr. Levent Gütay