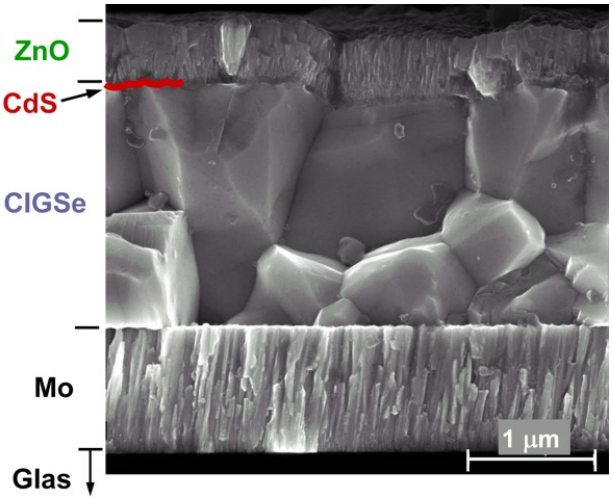
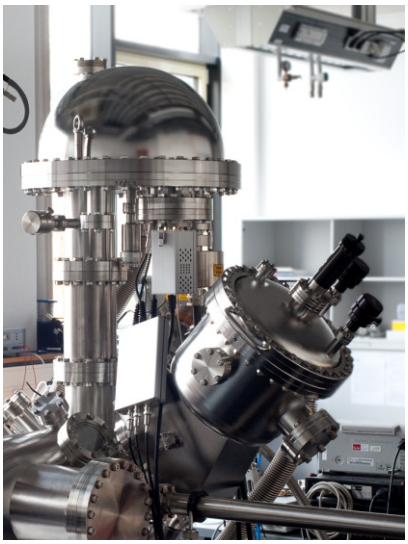
Septemper 2021

PhD, Master, and Bachelor Projects:
Nanoanalytics for Chalcopyrite Thin Film Solar Cells

In the last decade, chalcopyrite thin film solar cells reached the stage of mass production. Major advantages of this thin film technology are the beneficial absorption properties of the chalcopyrite absorber (e.g. $Cu(In,Ga)Se_2$ (CIGSe)), a superior long-term stability, and the possibility to apply large-area deposition techniques, resulting in an attractive balance of production costs and efficiency .
Yet, in view of further efficiency optimization, the interface formation between the absorber and the window layer and possible beneficial effects at grain boundaries are still not well understood. In particular, this is a result of the complex defect physics of the chalcopyrite materials, which opens an exciting research field with a strong relation to applications for renewable energy conversion.



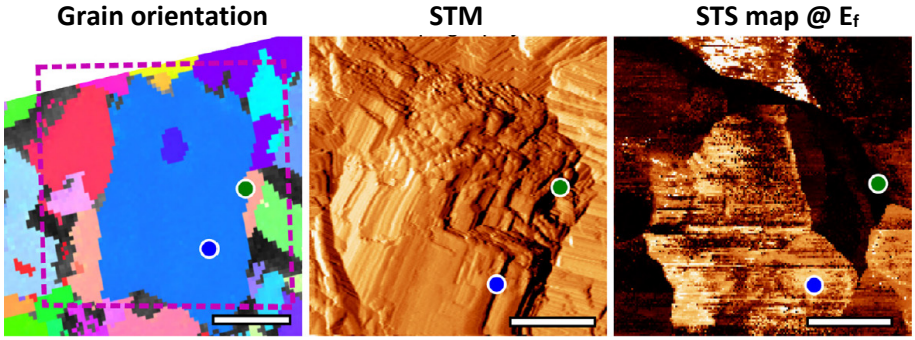
Cross section of a standard chalcopyrite solar cell. Image recorded with a scanning electron microscope. see Adv. Mat. Interf. **1**. 1300040



UHV set-up for photoelectron spectroscopy at the CeNTech.

In our group *Nanoscale Interface Analytics*, we offer various projects on this topic on the PhD-, Master-, and Bachelor level. The major focus is on surface- and interface defects (i.a. grain boundaries), which are of major concern to understand and control recombination losses in the solar cell devices. For these investigations we employ scanning tunneling spectroscopy (STS) and photoelectron spectroscopy (XPS/UPS). Ensuring a highly defined experimental setting for the samples, these main analytical techniques are performed under ultrahigh vacuum (UHV) conditions.

Students will have access to state-of-the-art laboratories, which are located at the Center for Nanotechnology (CeNTech). The international and interdisciplinary environment at the Physics Institute and CeNTech provides an excellent infrastructure allowing dynamic scientific exchange across the traditional disciplines.



Correlating grain orientations from EBSD with STM topography and defect levels from STS (Elizabeth et al. Acta Materialia **200**, 463 (2020)).

If you are interested in joining the group please contact Dr. Harry Mönig harry.moenig@uni-muenster.de for currently open positions and possible projects.