Project for Master thesis:

Development of novel smart solar collector material by vacuum deposition

Overheating and the resulting stagnation of solar thermal collectors is a common problem even in central European latitudes. The high temperatures occurring during stagnation lead to water evaporation, glycol degradation and stresses in the collector with increasing vapour pressure. Special precautions are necessary to release this pressure; only mechanical solutions exist nowadays. Additionally, the elevated temperatures lead to degradation of the materials that compose the collector, such as sealing, thermal insulation and the selective absorber coating. The goal of this project is to find a new way of protecting solar thermal systems without any mechanical device (e.g. for shading or for pressure release). Novel thermochromic coatings are developed, which exhibit a change in optical properties at a critical temperature T_c. Such films are deposited by reactive magnetron co-sputtering.

The effects of doping the thermochromic oxide films shall be studied in great detail. The electronic and optical properties of these films shall be characterized by methods such as X-ray photoelectron spectroscopy (XPS), temperature-dependent electric resistivity measurements, and infrared emissiometry.

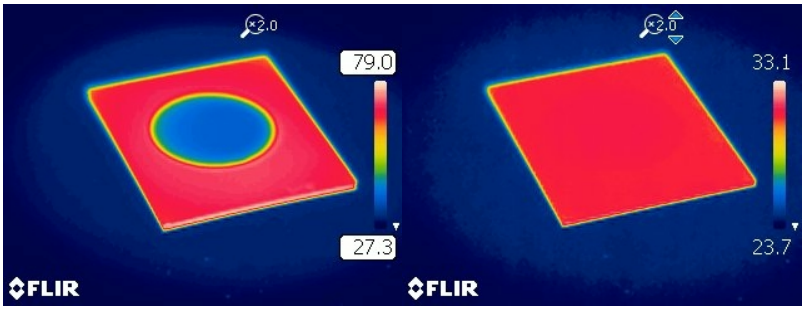
The fascinating optical properties of these thermochromic films elucidate the way towards novel “intelligent” thermal solar collector materials.

We offer:

- an interesting research topic for a master thesis of four to six months
- an interdisciplinary and creative environment for academic research
- well-equipped laboratory with infrastructure for vacuum deposition of thin films and multiple tools for their characterization, scientific and technical introduction and supervision

We demand:

- a good background in physics, nanotechnology or materials science
- interest in the research topic
- ability for team work



Infrared imaging of the thermochromic behaviour of an inorganic thin film. Above the transition temperature, the film shows metallic behaviour and is opaque (image on the left). Below the transition temperature, the film is semiconducting and therefore IR – transparent (image on the right).

Contact:

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