



DLR – DAAD Fellowships

Fellowship No. 403

Research Area : Transportation

Research Topic: **Thermoelectric transport in multi-band systems: comparison between experiment and modelling**

DLR Institute: Institute for Materials Research, DLR Cologne

Position: Doctoral Fellow

Openings: 1

Job Specification: **Thermoelectric generators** can convert heat directly into usable electrical energy. As they function without moving parts or working fluids thermoelectric generators require virtually no maintenance. They are therefore well-suited to increase the energy efficiency of various industrial processes or supply power in remote applications (space probes, space stations).
The functional material properties can be modelled with good accuracy using semi-empirical models based on the Boltzmann Transport Equations. While employing single band models is relatively straightforward and is employed frequently, prediction of the behaviour at high temperatures requires taking into account more than one electronic bands. The task of the PhD candidate is to develop a suitable multi-band model for thermoelectric materials based on magnesium silicide; starting from already existing transport data. The PhD will also encompass the revision of an existing Hall system for the measurement of carrier mobility at high temperature as this will provide the necessary experimental input for the model. The PhD will furthermore include a close collaboration with the University of Giessen, where low temperature measurements of the thermoelectric properties shall be performed. This allows for a validation of the model at low temperature and an understanding of the relevance of different scattering mechanisms in different temperature regimes. Eventually, the model will yield an understanding of the change of the electronic band structure with temperature and composition, providing a path for possible further optimization of the thermoelectric properties.

The work comprises calculations, measurement technique development and some program coding and will be embedded in a Young Investigator's Research Group, collaborating with colleagues working on material synthesis, contact development, module design and technology as well as measurement methodologies.

Required Qualification: MSc (or comparable) in Physics, Technical Physics, Materials Sciences, Solid State Chemistry or related
Experience in programming
Good knowledge in solid state and semiconductor physics
Interest in measurement technique development

Advantageous Skills: Ability to work in a team
MATLAB, LabView
Background in electrical engineering

English competence: See requirements on www.daad.de/dlr; fluent

Earliest Start Date: 01.09.2019

Application Deadline: until position filled

Further Information: <http://www.dlr.de>
http://www.dlr.de/wf/en/desktopdefault.aspx/tabid-1696/3089_read-3739/
<http://www.daad.de/dlr>