

## **Helmholtz–OCPC Programme 2017-2021 for the Involvement of Postdocs in Bilateral Collaboration Projects with China**

partly funded by the  
Office of the China Postdoctoral Council (OCPC)  
of the Ministry of Human Resources and Social Security  
(MoHRSS)

**Project Proposal: Mobility of charge carriers in self assembled monolayers**

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## **Part A**

### **Project Proposal:**

The research activities of our institute (IFG) within the Helmholtz Research Programme STN (Science and Technology of Nanosystems) focus on the spectroscopic characterization of various nanomaterials in close collaboration with partner institutes (in particular with ITCP, IKFT and AOC). For the joint projects in Topic 2 (Nanomaterials-Function and Manufacturing) we employ primarily a sophisticated ultrahigh vacuum (UHV) apparatus "THEO" for photoelectron spectroscopic (XPS, UPS and AES) studies on both model catalysts (single crystals) and technologically relevant oxide powders. In addition, this apparatus collects high quality infrared (IR) data with extremely high sensitivity and stability, which allows carrying out both IR reflection-absorption spectroscopy (IRRAS) experiments at grazing incidence on well-defined metal oxide model systems and FTIR transmission measurements for nanoparticles (NPs) supported on an inert metal mesh.

The spectroscopic investigations with the "THEO" at IFG are complemented by near-edge X-ray absorption fine structure (NEXAFS) spectroscopy using a complex, multichamber UHV-system at the HESGM beamline of synchrotron facility BESSY II in Berlin. For understanding the surface chemistry of complex nanostructured catalysts it is crucial to acquire reference data for well-defined model systems (single crystals). We have successfully applied this approach to various metal oxides and oxide-supported metal NPs. For example, recently we have reported the combined XPS and UHV-FTIRS investigations of catalytically highly active ceria nanorods based on a thorough surface-science study on different  $\text{CeO}_2$  single crystals by using CO as a probe molecule. Overall, the combined XPS/NEXAFS and IR results will provide detailed information about the structural, electronic and reactive properties of catalysis-relevant nanomaterials.

Our institute is offering a postdoctoral fellowship that focuses on the current research within STN. The postdoctoral fellow will conduct spectroscopic (XPS, NEXAFS and IR) experiments on model oxide catalysts (e.g. cerium oxide) and nanostructured powders using "THEO" at IFG and the NEXAFS apparatus at BESSY II. She/He will work in close collaboration with our partner institutes aiming at spectroscopic characterization of various catalysis-relevant nanomaterials, e.g., oxide-supported metal NPs ( $\text{Pt/CeO}_2$ , ITCP), core-shell systems (AOC, ITCP), and bimetallic nanoalloy catalysts (IKFT, ITCP). In addition, it has been planned that the candidate will work closely with the researchers of the CAT-beamline at ANKA (the synchrotron light source facility at KIT) for additional investigations.

### **Qualifications of the Applicant required:**

Candidates should hold a Master and PhD in physics or chemistry and possess research experience in the fields of chemical surface functionalization and surface characterization (XPS, ToF-SIMS, IR and Raman spectroscopy, XPS), oxide-surfaces, and knowledge in the field of heterogeneous catalysis.

**Part B**

- Reason for the candidate's personal interest in a research visit to KIT
- CV and copies of certificates
- List of publications
- Two letters of recommendation
- Evidence of competence in English

**Part C**

- Completion of PhD within the past five years
- Not older than 35 years at the time of application