

Helmholtz Call for Chinese Applicants Interested in Running for CSC 2021 Fellowship

- Helmholtz Centre:** Forschungszentrum Jülich GmbH – www.fz-juelich.de
- Department/Institute:** Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C)
https://fz-juelich.de/portal/EN/institutes/ernst-ruska-centre/_node.html
- Supervising scientist:** Prof. Dr. Joachim Mayer, Katherine MacArthur
- University for registration or for a future degree:** RWTH Aachen University
- Research Field:** Materials Science/Physics
- Position open for:** PhD Student X Sandwich PhD Student
- Title of the research:** Development of High Temperature In-Situ EDX Analysis for the Study of Composition Changes in Materials

More description of research topic:

New developments in energy dispersive X-ray (EDX) detectors, which are routinely used for chemical composition analysis in electron microscopes, enabled collection of quality spectra even at elevated temperatures up to 1000°C. This opens up a wealth of possibilities for materials science investigations. In particular we can now begin to investigate compositional changes occurring during post-synthesis heat treatments of bimetallic nanoparticles. phase changes like eutectoid or peritectoid transitions that occur in alloy systems at these temperatures.

The project will begin with an extensive TEM (transmission electron microscopy) training including conventional and high resolution TEM and scanning TEM (STEM) imaging techniques, as well as methods of qualitative and quantitative chemical analysis with the aid of the characteristic X-rays produced from interactions between the sample and electron beam. These techniques can then be applied to in-situ heating studies for a range of materials science problems. Depending on the interest of the candidate it will be some combination of looking at solid state phase transformations in annealing of alloys; looking at post-synthesis heat treatments for improving the stability of catalyst nanoparticles; or observing the breakdown of Li-battery precursors during sintering. In all cases, the real-time heat treatments in the microscope will be carried out to track in-situ the progress of diffusion and related compositional changes in the TEM sample. The ultimate aim of the project is to quantify the compositional changes whilst negating the effects of the electron beam. This combination of techniques have never before been applied in this way.

Specific requirements:

- A first degree in materials science, particle physics or equivalent is a requirement. Previous experience with electron microscopy is beneficial but not essential.
- The candidate should have an interest in understanding the underlying materials changes being induced through heating.
- Experience with or willingness to learn the python coding language is very important as this is the language which all the data analysis will be carried out in.

Working Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2021

Language Requirement: Very good knowledge of English language, written and spoken. German language courses are organised in the context of our in-house training program and are free of charge.

Name and Address of the Supervisor: Forschungszentrum Jülich GmbH, Prof. Dr. Joachim Mayer, Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C-2), 52425 Jülich, Germany; j.mayer@fz-juelich.de