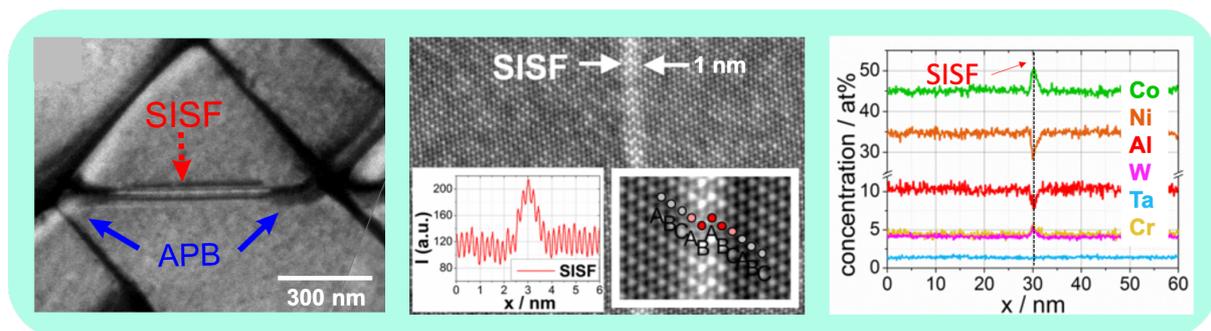


Open Position for Phd Candidate – Analytical electron microscopy on planar defects

There is an opening for a PhD candidate researcher position in the new research group **MNM** (microscopy of nanoscale structures & mechanisms) guided by Dr. Yolita Eggeler, which is part of the central laboratory for electron microscopy (**LEM**) at KIT.

MNM uses high-resolution analytical scanning and transmission electron microscopy (SEM and TEM) to identify new material structures. We explore elementary processes which govern microstructural evolution during material processing. We are interested in the evolution of nano- and microstructures in functional (magnetic materials) and structural materials (high temperature materials, high entropy alloys). We also work on the new materials, which are engineered on the atomic and nano scale (e.g. by 3D nanoprinting) in the excellence cluster 3D Matter Made to Order (3DMM2O). MNM is in close contact with other material researchers at KIT and with material scientists from universities and research institutions in Germany and abroad.

As of October 1, 2020, we are looking for a PhD candidate (m / f / d) who fits well into our team. The research aims at establishing a so far unexplored link between elementary deformation mechanisms and atomic diffusion processes. Advanced SEM and TEM techniques (high resolution analytics and *in situ* experiments) are the central experimental characterization techniques. The research focusses on the physics and chemistry of planar defects that form during high-temperature deformation (plastic deformation of metals). Once these have formed, they attract or repulse atoms (diffusion-controlled segregation processes on the nanoscale). The figure below shows an example of a planar defects in a CoNi-based superalloy. It shows a planar fault on the left (SISF). In the center its atomic structure is shown in high resolution. And on the right one can see how atoms are attracted/repulsed by the planar defect (enrichment and depletion, depending on atom species).



It is currently being discussed whether this process should be thought of as a segregation phenomenon to planar crystal defects, or whether it rather represents a stress-induced phase transformation occurring during high-temperature deformation. This phenomenon will be studied in single-crystalline superalloys and in high entropy alloys. The project combines and draws on different areas of expertise, including materials processing (ingot metallurgy, melting, heat treatments), assessment of high temperature strength, and in particular advanced SEM and TEM techniques (including orientation imaging SEM, high resolution TEM, high resolution TEM spectroscopy and *in situ* TEM). The topic is not only scientifically interesting but also technologically important, for the understanding of microstructural processes which govern the service life of turbine blades for gas turbines, which are used in aero engines and in industrial powerplants (which will represent important backup systems after our society has moved towards renewable energies).

The research will be carried out in close collaboration with KIT's Institute for Applied Materials (IAM) and the Materials Science Department of the University of California, Santa Barbara (UCSB). It is embedded into the activities of the international scientific community and aims at providing new impulses to the field. In addition to the scientific day to day running of the project, the position allows to present results at international conferences, and close interactions with our collaboration partners at UCSB in California. It also involves training and supervising of students and guest scientists.

We are looking for highly motivated graduates with a master degree in the fields materials science, physics, chemistry or mechanical engineering, with a keen interest in advanced materials topics. It offers the opportunity to gain hands on experience in powerful characterization techniques, and, at the same time, to widen ones outlook and acquire technological expertise in an important area. It allows to work independently with advanced students and to contribute to the formation of a new dynamic and interdisciplinary research group.

A scientific staff position (f/m/d) with a remuneration of **0.75 E13** is offered to candidates who aim for a doctor degree (german PhD degree). Funding is secured **for 3 years** and can be extended as required. The position also allows to take part in advanced training courses offered by KIT for young scientists (f/m/d). We strive to fill the jobs with female and male employees as evenly as possible and would be particularly happy to receive applications from young female researchers. With appropriate suitability, severely disabled people are given priority.

Please send your **application by E-mail to yolita@ucsb.edu** by **July 30, 2020** (cover letter explaining motivation, curriculum vitae, diplomas, pdf copy of your master's thesis (preliminary versions welcome) and other relevant documents, if applicable). Please contact Dr. Yolita Eggeler, if you have questions about the project, the possibilities of your development or the type of work and the MNM in general. (Dr. Yolita Eggeler is currently still at UCSB California, any discussions can initially only be conducted online via Skype or Zoom, in person starting August 2020.)

More information is available on the homepage: www.lem.kit.edu.

