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PHD POSITION "ELECTRON DIFFRACTION FOR NANOSCALE PRECIPITATES IN MODERN STEEL SYSTEMS"

We are searching for a PhD student (f/m/d) working on the topic "Electron diffraction for nanoscale precipitates in modern steel systems" at the Johannes Kepler University Linz.

Project background

The Center for Surface and Nanoanalytics is a physics institute dedicated to uncovering fundamental principles that govern macroscopic material behaviour. We focus on the nanoscale structure of materials, surfaces, and interfaces, and link these insights to microstructure and macrostructure through advanced analytical techniques and modelling. Our laboratory provides state-of-the-art electron- and ion-beam nanocharacterisation, along with complementary surface and interface analysis methods, to investigate a broad range of advanced materials.

A current research direction advances the characterisation of nanoscale precipitates in modern steel systems. This work addresses the practical demands of technical steel samples, efficient, cost-effective workflows that still deliver high accuracy and robust statistics, and the added complexity of multilayer coating systems that combine materials with distinct properties (e.g., steel substrates, zinc coatings, organic layers). The programme is carried out in close exchange with our cooperation partner voestalpine Stahl GmbH, combining applied materials science and fundamental understanding of microstructure-property relationships.

Job description

At our institute we established a toolbox for correlative electron microscopy and spectroscopy to investigate phases, grain boundaries and precipitates in steel and steel coating systems. Building on this foundation, the doctoral candidate will study how small precipitates and nanoscale structures influence the processing and final properties of these steel systems. The aim is to develop fast, reliable workflows that combine SEM-based methods such as electron backscatter diffraction (EBSD) and transmission Kikuchi diffraction (TKD) with TEM techniques, such as high-resolution TEM and nano-beam and precession electron diffraction (NBD and PED). The experimental program will be complemented by 4DSTEM and electron spectroscopy.

The doctoral candidate's task is to optimize the experimental methods and translate them into efficient, reproducible workflows for industrially relevant samples. This may involve post-processing via pattern correlation and the development of customized protocols within Python-based data analysis and visualisation frameworks; where appropriate, AI-assisted approaches may be incorporated. The work will be conducted in close exchange with the applied materials development groups at our industrial partner to relate nanoscale observations to mechanical and production-relevant behaviour. The PhD research should be conducted in a structured and rigorous

manner, with results disseminated through internal and external talks and presentations, as well as peer-reviewed journal articles.

Your profile

- Master's or Diploma degree in Materials Science/Engineering, Metallurgy, Physics, Chemistry, or a related discipline.
- Familiarity with the microstructures of advanced steels and/or electron microscopy; additional knowledge of mechanical testing or analytical techniques for microstructure characterisation is an advantage.
- Experience in Python-based data analysis and visualisation (e.g. HyperSpy, pyxem); broader scientific Python skills are beneficial.
- Excellent written and spoken English; basic German is an advantage.
- Strong interest in fundamental materials behaviour and its engineering implications, with willingness to engage with industrially relevant problems and datasets.
- High level of personal commitment; ability to work independently with responsibility for results and to collaborate effectively within a team.

What we offer

- Employment of 30 hours per week over the duration of the PhD project (3-year position). The minimum salary in accordance with the collective agreement is € 2.832 gross per month (14 times per year, CA Job Grade: B1)
- Attractive campus environment with good public transportation connections
- State-of-the-art research infrastructure
- Dynamic research environment
- Broad range of on-campus dining services/healthy meals (organic food at the cafeteria)
- Exercise and sports classes (USI)

Applications

We look forward to receiving your application until 26 April 2026 including the following documents via email in one PDF document to heiko.groiss(at)jku.at:
- Motivation Letter (max. 2 pages, in English)
- Curriculum vitae with contact details of references (max. 3 pages, in English) and the previous scientific achievements (conference participation, publications, etc. if available)

The Johannes Kepler University wishes to increase the proportion of academic female staff and, for this reason, especially welcomes applications by qualified women. If applicants are equally qualified, a woman will be given preference for this position. The university welcomes applications from qualified applicants with physical disabilities. These applications will be given special consideration.

For information on the open position, please contact Heiko Groiß, heiko.groiss(at)jku.at or Philipp Kürnsteiner, philipp.kuernsteiner(at)jku.at and see https://www.jku.at/en/center-for-surface-and-nanoanalytics-zona/cdl-n-phase/.