Institute of Micro- and Nanostructure Research

Bachelor / Master Thesis

CENEM Center for Nanoanalysis and Electron Microscopy

Topic: **Same-location microscopy of novel SCALMS catalysts**

Description: Supported Catalytically Active Liquid Metal Solutions (SCALMS) have shown excellent performance for alkane dehydrogenation, especially in terms of resistance against coking. SCALMS consist of a porous support containing catalytically active low-melting alloy particles (e.g. Ga-Pd, Ga-Pt) which are liquid at reaction temperature. Such novel catalytic materials combine selectivity, productivity, robustness, and ease of processing at the highest possible level.

To be able understand the outstanding performance of this new catalyst material, high-resolution and 3D characterization on the nanoscale at various length scales is needed to reveal the local complex pore and particle morphology before and after the catalytic process. To investigate those dynamic transformations happening during catalytic conversion of the alloy particles at the same location, you will learn and get experience how to prepare, image and reconstruct SCALMS samples with the lab-based ZEISS Xradia 810 Ultra X-ray microscope that enables a spatial resolution of down to (50 nm)³. You will apply this same-location X-ray microscopy workflow to different support materials following various sample preparation strategies.

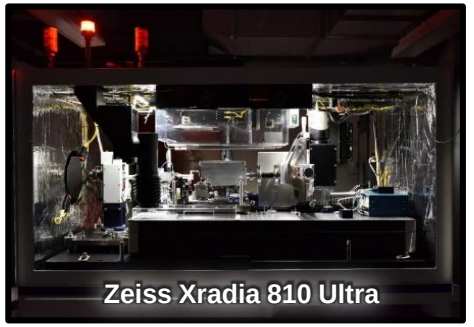
Topics of interest:
- X-ray tomography
- Correlative microscopy
- Image processing in 2D and 3D
- SCALMS catalysts

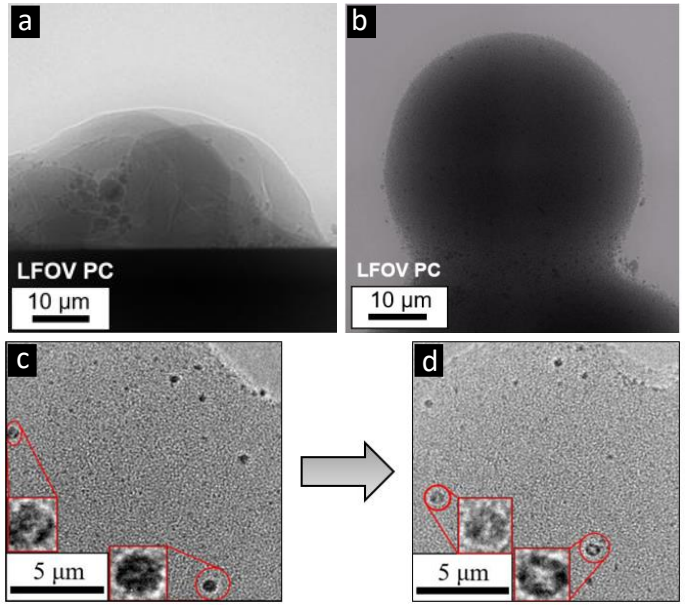
Start: 5/22 or as soon as possible

Supervisor: Simon Carl (sim.carl@fau.de, +49 9131 85-70404)

Group leader: Dr. Benjamin Apeleo-Zubiri (benjamin.apeleo.zubiri@fau.de)

Professor: Prof. Dr. Erdmann Spiecker (erdmann.spiecker@fau.de)





(a) and (b): SCALMS supraparticle support structures before catalysis in large field of view phase contrast Nano-CT (LFOV PC). (c): Identical location Nano-CT analysis of SCALMS Ga-Pt droplets supported on Trisopor™ silica glass primary particles before catalysis and (d) after catalysis.