SFB/TRR 21 - Seminar
14. Juni 2016, Ulm

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Correlative microscopy / spectroscopy in multi-disciplinary material and device research

The innovation potential of correlative microscopy / spectroscopy (CORRMIC) will be demonstrated for energy materials and device and bio-medical tissue research. Even though both topics seem not to have much in common we will demonstrate that advances in both fields mutually support one another.
At the beginning of the 'food-chain', laboratory-scale x-ray microscopy (XRM) will be used to obtain large volume overviews at small, lab-scale voxel sizes (~700nm3) for a precise localization of areas of interest. XRM tomography and correlative workflows in microscopy and spectroscopy will enable in-depth structural, compositional, and optical analyses but such approaches still have huge developmental needs.
These include: (i) handling (evaluation, storage, correlation / overlay, deployment to users) of vast amounts of data, (ii) exploration of specifically designed sample preparation protocols especially when the workflow foresees correlation of XRM with dual beam focused ion- and electron beam microscopies (FIB/SEM), Raman spectroscopy, and secondary ion mass spectrometry techniques and so on, (iii) exploration of sample pipelines through various microscopy / spectroscopy machines determining a variety of material properties at various length scales from several mm down to sub-nm-resolution, (iv) exploitation of in-situ mechanical testing of samples leading to unprecedented correlated data sets.

CORRMIC approaches in the center of energy materials and device research and bio-medical bone and kidney disease research will be presented.
Here, in particular the correlation of physical properties such as electrical, optical, structural, compositional, mechanical will be performed relying on the combined use of characterization techniques, implemented in FIB/SEMs.
Selected nano-composites from the area of energy materials and devices e.g. Si-nanostructures such as wires (NW) and cones (NC), GaN nanostructures, transparent conductive oxides e.g. Al doped ZnO, coinage metal nanoparticles e.g. wires, spheres, graphene and other 2D materials integrated on Si wafer platforms will be presented for applications as thin film solar cells or light emitting diodes. Bio-medical samples stem from human and mice model tissue of the areas of kidney diseases and -injuries as well as bone degradation and -anomalies.

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