



SEMINAR

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CFEL – Building 99, seminar room IV (1st floor)

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Multiscale Movies of Microstructure Evolution

Many materials such as metals, ceramics and rocks are structurally organized in a hierarchical fashion. Likewise industrial components often have a complicated 3D geometry. The establishment of 3D materials models that can predict the structural changes on all relevant scales during synthesis and operation would be a game changer for optimization of materials and components. The 4th generation x-ray sources provide truly unique options for establishing and testing such models via the acquisition of 3D movies of structural elements, orientations and local strain at several length scales.

A dedicated microscope at ID06, ESRF, is established with the aim to explore these possibilities. 3D mapping at the micron-scale is provided by 3DXRD and tomography. Dark field transmission x-ray microscopy allows focusing on embedded grains and domains with a resolution of currently 50 nm. The highest resolution is to be provided by use of coherent x-ray methods. I present the principle of the microscope, discuss the relevance of various x-ray optics - such as compound refractive lenses and multilayer Laue lenses - and demonstrate its use for studies of plasticity, domain evolution in ferro electrica, bio-minerals, and 3D mapping of dislocations.