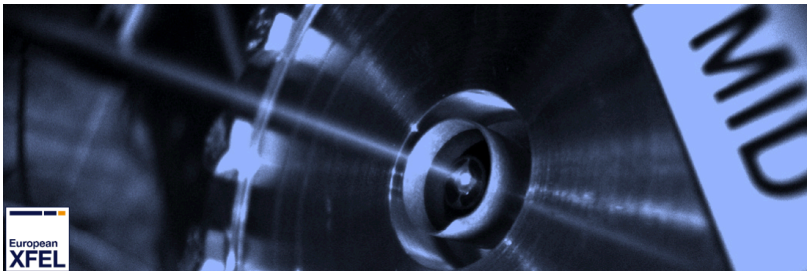

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Time resolved high energy x-ray diffraction from nanostructures and interfaces

Wednesday 18 January 2023 11:05 (20 minutes)

In the recent years we have established high energy surface sensitive X-ray diffraction as novel tool for the investigation of surfaces and nanostructures. It allows a significant acceleration of the measurements, making fast kinetic processes in in-situ and operando experiments accessible, which could not be addressed before [1-5]. These experiments allow to address fundamental processes in heterogeneous catalysis and electrocatalysis involved in energy production and conversion processes. Due to the large Ewald sphere at high photon energies in the 70-80 keV regime in combination with large 2D detectors, reciprocal space maps from nanoparticles can be obtained, allowing orientation, size and shape determination in stationary measurement geometries at elevated gas pressures and in the presence of electrolytes. Further on, using high energy photons, diffuse scattering from defects in solids can be investigated. In an ultrafast optical pump –hard x-ray probe experiment from metal nanoparticles employed as heterogeneous catalysts reciprocal space mapping can be performed without the need of additional sample scanning, which speeds up the experiment and will make transient diffraction signals from nanoparticle facets accessible. This can be related to light induced nanoparticle shape changes and ultrafast structural rearrangements possibly leading to more active catalysts for reactions relevant for the hydrogen economy, such as methanol synthesis, methane combustion or ammonia synthesis.

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Primary author: STIERLE, Andreas (CXNS, DESY)

Presenter: STIERLE, Andreas (CXNS, DESY)

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