5th Science Workshop of the Program MML

FROM MATTER TO
MATERIALS AND LIFE

©KTG Karlsruhe Tourismus GmbH, Picture: Joachim Mende

Contribution ID: **198** Type: **Talk**

Resonant soft X-ray photoelectron spectroscopy of metal-oxide nanoparticles dissolved in aqueous solution

Significant effort is being invested to find abundant, catalytically active and stable (photo)electrocatalysts, with transition metal oxides being an associated promising material class. The issues of efficiency and stability are due to related electronic-structure processes driving the oxygen evolution reaction and hydrogen evolution reaction at the solid-liquid interface between the electrocatalyst and the electrolyte. I will present our spectroscopic results on hematite (α-Fe2O3) nanoparticles dissolved in water,[1] which mimic the interface of this model (photo)electrocatalyst for water splitting in their true environment and were obtained using soft-X-ray synchrotron photoemission spectroscopy in combination with the liquid microjet technique at BESSY II. The method is shown to be sufficiently sensitive for the detection of adsorbed hydroxyl species, resulting from water dissociation at the nanoparticle surface in aqueous solution. We obtain signals from surface OH from resonant, non-resonant, and so-called partial-electron-yield X-ray absorption (PEY-XA) spectra. An observed intensity variation of the pre-edge peak, when comparing the PEY-XA spectra for different iron Auger electron decay channels, can be assigned to different extents of electron delocalization. From the experimental fraction of local versus non-local autoionization signals we infer an ultrafast, ~1 fs, charge transfer time from interfacial Fe3+ to the environment,

Author: SEIDEL, Robert (Helmholtz-Zentrum Berlin)

Presenter: SEIDEL, Robert (Helmholtz-Zentrum Berlin)

Session Classification: Parallel: Matter (RT1)

Track Classification: RT1