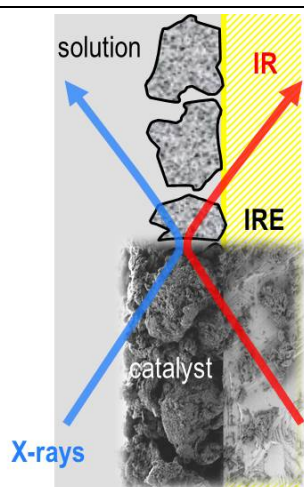


Master project

Bioenergy and Catalysis Laboratory, Paul Scherrer Institut, 5232 Villigen

Combined ATR-IR/EXAFS cell for catalytic solid-liquid interfaces



Catalysis by solid materials immersed in a solution is considered difficult to study using common spectroscopic and diffraction methods. However, it has been repeatedly shown that EXAFS measurements are feasible. Despite the strong interference from the majority solvent, IR spectroscopy can also be measured in the attenuated total reflection (ATR) mode. The ATR-IR/EXAFS combination offers the unique possibility to obtain information from the adsorbate layer on the catalyst surface and from the active element (oxidation and coordination states).

The aim of the project is to combine the two spectroscopic methods in a single cell. Therefore, the design, manufacture and test of the ATR-IR/EXAFS cell in a homemade set-up to be used at beamline SuperXAS of the SLS will be carried out.

Metal based catalysts (Pt, Pd, Ru, Cu supported on Al_2O_3) will be prepared and characterized for their textural properties. The catalysts will be tested for CO adsorption from the liquid phase using ATR-IR spectroscopy. Reduction by H_2 -saturated solvent and CO adsorption will be followed by EXAFS under identical conditions to the ATR-IR experiment. The experiments will help demonstrating the feasibility of the combination.

Tasks

- Interaction with the mechanical workshop
- Mounting and testing of the set up in the laboratory and at the SuperXAS beamline
- Catalyst preparation and basic characterization (BET, XRD)
- Conducting ATR-IR measurements and EXAFS experiments

Benefits

- Training in standard and advanced characterization techniques
- Experience with synchrotron radiation
- How to write scientific reports and to present results on conferences/workshops
- Work in an international team

Type of work: Master

Application: biomass valorization, fine chemicals

Nature of work: experimental

Requirements: interest in materials science, characterization methods, catalysis

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