

PhD-Project: IR-Spectroscopic Investigations on Catalytically Relevant Oxide Surfaces

Metal oxides find application in a wide range of catalytic applications. For example, zinc oxide is used the key component in the catalyst for methanol synthesis, one of the industrially most relevant processes. Alike other oxides, it is also commonly used as a substrate material for other reactions. Solid oxid fuel cells (SOFCs) present another field of application of metal oxides, where they are used as solid electrolytes.

In this PhD-project within the framework of the [Helmholtz Research School Energy-related Catalysis](#), the interested candidate will investigate the interaction of different relevant molecules (e.g., CO, CO₂, H₂O, ethanol) with oxide single crystal surfaces in ultrahigh vacuum mainly using infrared reflection absorption spectroscopy (IRRAS) supplemented by other surface science techniques (XPS, UPS, LEED, TPD) available in the same apparatus located at the IFG or further complementary techniques ex-situ such as XRD or synchrotron based measurements (NEXAFS, high-resolution XPS). The results from these experiments on well-defined model systems are to be compared to more complex, yet realistic samples such as thin films grown on metallic substrates or powder samples, which can be studied in the same apparatus. This allows for a rather straight forward transfer of insights from the model systems to the rather complex systems that are also used in real world applications. This modus operandi is demonstrated in a recent study on CO₂ adsorption on ZnO(10 $\bar{1}$ 0), the first reported IRRAS investigation conducted on a ZnO single-crystal substrate ([Buchholz et al., "Carbon Dioxide Adsorption on a ZnO\(10-10\) Substrate Studied by Infrared Reflection Absorption Spectroscopy", PCCP, DOI: 10.1039/C3CP54643H](#)).

Qualification

A strong background in (Physical) Chemistry, Physics, Materials Science, or a related field, an interest in working interdisciplinary at the interface between physics, chemistry, and surface science, and good command of English is required. Experience with ultrahigh vacuum equipment, surface science techniques (XPS, UPS), or infrared spectroscopy is highly appreciated.

Institute/Department

Institute of Functional Interfaces (IFG).

For further information, please contact:

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