Faculty of Mathematics and Natural Sciences

Department of Chemistry

Metalorganic Chemistry and Photochemistry

Expertise

Dr Schwalbe and his group investigate the activation of small molecules at metal complexes. The main focus is not only research on electrocatalytic but also photocatalytic processes. With the help of renewable energy sources, and preferably the direct use of sunlight, formally unreactive molecules such as CO2, O2 or H2O should be transformed efficiently into valuable compounds. The syntheses of metal complexes is in fact in the foreground, but following the comprehensive chemical, structural and physical characterisation of the newly designed compounds their catalytic properties are especially explored. At the moment Dr Schwalbe is working in particular on the light-driven reduction of CO2 to CO or HCO2H, and in doing so he examines the influence of different reaction parameters (e.g. water content of the solvent, used photosensitizer or excitation wavelength) on the product selectivity. Furthermore the development of catalytic systems for homogeneous as well as heterogeneous water oxidation or oxygen reduction is pursued. For this, Dr Schwalbe considers on the one hand the fixation of molecular systems on electrode surfaces, and on the other hand the direct integration of monomeric building blocks in polymer networks. Within his research efforts he creates promising catalysts (and dyes) that can later be applied in e.g. fuel cells or photo-reactors.

Scientific Services

- Apparatus for the characterization of organic and organometallic compounds (including NMR spectrometers, Maldi and ESI mass spectrometers, UV/Vis and fluorescence spectroscopy, gas chromatography and X-ray crystal structure analysis)
- Techniques and equipment for working under inert conditions (e.g., "glovebox" technique)
- Basic equipment for the determination of electrochemical properties of molecular systems

Topics / Trends

Hybrid Systems
Climate / Climate Change
Sustainability & Ressource Efficiency

Industries

Energy, Utilities & Raw Materials