

Bachelor / Master Research Project

CO₂ Electroreduction on carbon-based catalysts

Solar Fuels

Electrochemical conversion of CO₂ using solar energy represents a pathway to renewable and sustainable synthesis of chemicals and fuels. Electrochemical reduction of CO₂ however, is a complicated and energetically-demanding multi-electron reaction and requires highly active and product-selective catalysts, ideally made from environmentally friendly and earth abundant materials.

CO₂ reduction catalysts

Metals are known as state of the art catalysts for the electroreduction of CO₂. However, very often the conversion efficiency to hydrocarbons is low. As an alternative approach, we investigate catalysts based on MeN₄-chelate-centers integrated in graphene layers of carbon blacks.



Fig.: Cell for electrochemical mass spectrometry

These materials showed in recent studies a promising activity for the CO₂-reduction. The performance of these catalysts can be tuned by the metal-ion used in the chelate center and the molecular structure of the carbon matrix.

Project Overview

In the proposed project, you will prepare catalysts by thermal decomposition of different organic precursors and characterize them by advanced electrochemical methods. Product analysis will be done by mass

spectrometry and by gas-chromatography. Furthermore, the excellent research infrastructure of the institute allows the analysis of the materials by numerous other methods (e.g XPS, XRD, Raman).

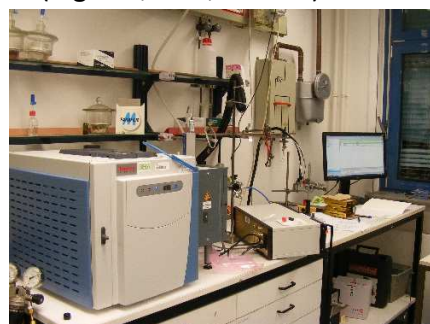


Fig. :Gaschromatograph-System

Research areas:

- Advanced electrochemistry
- Materials Synthesis
- Material analysis (e.g. Raman, XPS, XRD)
- Trace gas analysis

Target Group:

Bachelor or Master students in Physics, Chemistry, Material Science or related fields.

Language: German/English

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