

Semesterarbeit/ Forschungspraktikum/ Bachelor's Thesis CIW

for students of Chemical Engineering (CIW)

Professur für Anorganische Chemie, Prof. Dr. Klaus Köhler & Franz Bannert

Construction and test of an electrochemical setup for (co-)electrolysis technologies for the production of electricity-based fuels

Motivation

The gas-phase electrolysis in the medium temperature range (200-300°C) with solid phosphate electrolytes opens up interesting perspectives for producing electricity-based fuels. The global aim of the project lies in the synthesis, testing, and optimization of electrode and electro-catalyst materials for the electrolysis of water vapor and co-electrolysis with CO₂ for the production of hydrocarbons, methanol, or ethers.

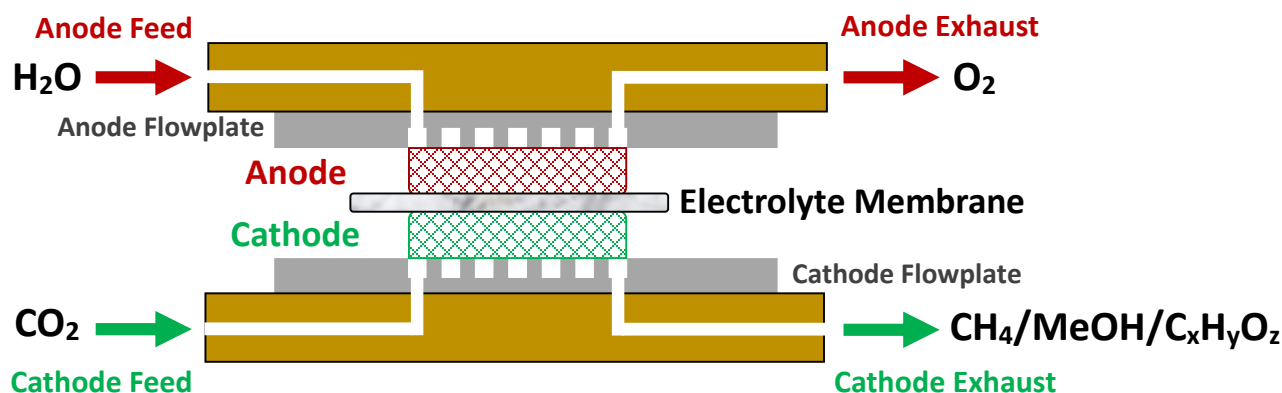


Figure: Electrolysis cell cross-section scheme showing promising "dream reaction" products from co-electrolysis operation

Tasks

Within this framework and after an appropriate introduction, you will be tasked with constructing an electrochemical flow cell setup, including the calibration of the gas flow control unit and the method optimization for a gas chromatography (GC) instrument. You will perform electrochemical tests to validate the setup and analytical methods. You will synthesize electrocatalyst materials focusing on solid solution oxides and their characterization.

Methods

- Setup construction, this includes: gas piping, water evaporator and heater system installations
- Synthesis of solid solution oxide systems (co-precipitation, impregnation, etc.)
- Standard characterization techniques (pXRD, TPR/ TPD, elemental analysis, etc.)
- Development of methods for online gas chromatography for product analysis
- Implementation of electrochemical characterization and tests (EIS, conductivity, etc.)

Start: September 2023 and later

Language: English or German

Contact:

Franz Bannert, franz.bannert@tum.de, 089-289-54225, lab CRC-2042

Prof. Dr. Klaus Köhler, klaus.koehler@tum.de