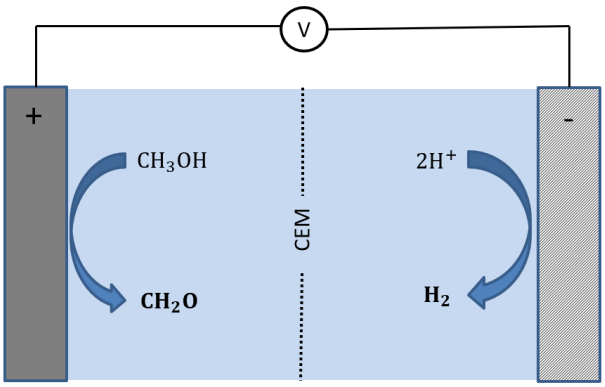
Professur für Chemische und Thermische Verfahrenstechnik
Campus Straubing für Biotechnologie und Nachhaltigkeit
Technische Universität München

Driving The Dream Reaction: Electrochemical Flow Reactor Construction for Formaldehyde Synthesis

Master's Thesis (Experimental)

Objective:
This project aims to build and evaluate a lab-scale electrochemical flow reactor for the synthesis of dry formaldehyde from anhydrous methanol. The work includes reactor construction, commissioning, and performance analysis under varying electrolyte concentrations and current densities.



Background:
Formaldehyde is a platform chemical currently produced via energy-intensive thermal oxidation of methanol, yielding aqueous solutions that require significant downstream separation. Recent studies have shown that electrochemical oxidation of anhydrous methanol offers a sustainable alternative. At the Laboratory of Chemical Process Engineering, we aim to translate this concept into an operational lab-scale flow reactor and optimize key performance indicators for potential scale-up.

Tasks:
- Review literature and become familiar with electrochemical methanol oxidation
- Design and construct an electrochemical flow reactor system
- Commission the setup and carry out safe experimental operation
- Perform electrolysis experiments to evaluate Faraday efficiency and selectivity
- Analyze performance under different electrolyte conditions and flow rates

Requirements:
- Strong interest and prior experience in laboratory experimental work
- Basic knowledge of electrochemistry, thermodynamics, or reactor engineering
- Independent working style and responsibility in handling equipment

Contact: Hamzah Elfaitory
Possible Start: Upon request
Phone: +49 (0) 9421 187-292
Office: Uferstrasse 53, 01.3505.110
Email: hamzah.elfaitory@tum.de