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

Bachelor's Thesis/ Research Internship

(Experimental)

Experimental Investigation of Chemical Equilibriums via Nuclear Magnetic Resonance Spectroscopy (NMR)

Description

Formaldehyde is a feedstock for the production of polyoxymethylene dialkyl ethers (OME), whose use as synthetic fuel is becoming increasingly important. In this process, formaldehyde polymerizes with aliphatic alcohols in an acid-catalyzed manner using equilibrium reactions. Compared to petroleum-based diesel fuels, OME exhibit significantly cleaner combustion. Compared to other synthetic fuels, OME stand out as drop-in capable feedstock in conventional diesel engines.

At the Laboratory for Chemical Process Design, research into further improving the fuel properties of OME and the associated manufacturing processes is constantly being conducted. The physicochemical properties of the system of formaldehyde, water and alcohol (e.g. volatility, solubility, etc.) are strongly dependent on its degree of polymerization and composition. The description of the chemical equilibrium is therefore crucial for the modeling of systems containing formaldehyde. Due to the high reactivity of the formaldehyde derivatives, the use of non-contact analytical methods such as nuclear magnetic resonance spectroscopy (NMR) is preferable.

Within the framework of this scientific work, an existing experimental measurement method for quantifying the system components is to be expanded for the use of a new feedstock. In addition, experiments in the batch reactor to determine the temperature-dependent chemical equilibrium are to be planned and carried out.

Requirements

- interest and prior knowledge of laboratory analytical work
- prior knowledge in the field of technical chemistry or chemical reaction engineering desirable
- high degree of independence and personal responsibility

Tasks

- familiarization with the reaction system based on a literature research
- modification of a NMR measurement method
- measurement of the chemical equilibrium and determination of temperature-dependent equilibrium constants

Possible start:	immediately
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