

Bachelor's Thesis/ Research Internship/ Master's Thesis

(Experimental)

Production and purification of polyoxymethylene dialkyl ethers and measurement of pure substance data

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. For the calibration of analytical measurement devices like nuclear magnetic resonance spectroscopy (NMR) or gas chromatography purified OME samples, each with a specific degree of polymerization, are required. These samples are also imperative for the measurement of physicochemical properties (e.g. vapor pressure, density, flash point, etc.) of the different OMEs, which find use in process engineering and the associated simulative optimization.

Within the framework of this scientific work, larger amounts of OME are to be produced from given input materials and separated from their stock solution as well as according to their degree of polymerization. Analytical NMR measurements are to be carried out in parallel to insure the purity of the prepared samples. Lastly, the pure substance vapor pressures are to be measured and correlated by modifying parameters of relevant functions.

Requirements

- interest and prior knowledge of laboratory analytical work desirable
- prior knowledge in the field of organic chemistry and laboratory experimental work
- high degree of independence and personal responsibility

Tasks

- familiarization with the reaction system based on a literature research
- planning and execution of the production and separation of OME
- NMR measurements of the purity of the prepared samples

Possible start: immediately
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