Sustainable Process Engineering
Chemical Reactor Engineering

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

Intensified amine quaternization in plug flow and spinning disc reactors

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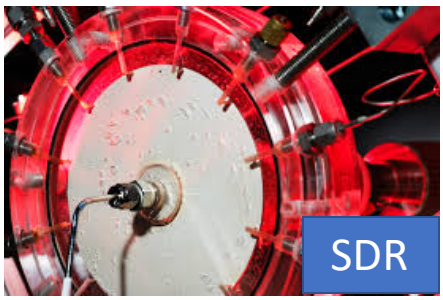
Introduction

Quaternary ammonium salts (QAS) are readily applied in fabric softeners, as phase transfer catalysts, dispersants and germicides. Tertiary amines are currently alkylated primarily with alkyl halides to form these QASs. The conventional process is performed in batch and uses harmful chemicals. There is a significant incentive to create a more sustainable process.

Project summary

This project aims to develop a continuous process for QAS production for improved controllability, flexibility and safety. Process intensification will enhance the capacity and economics of the process and green reagents e.g. dimethyl carbonate lower its environmental impact. A consecutive decomposition reaction and viscous phase formation pose additional challenges. Reaction kinetics are measured in-line using plug flow and spinning disc reactors for the formation and decomposition reaction. Understanding the effects of temperature and solvents is key. Modeling provides further means to intensify and optimize the process.



Project goals

- Measuring reaction kinetics with in-line H-NMR in PFRs and SDRs
- Modeling of the process and its mechanism with MATLAB and DFT respectively
- Exploring catalysis and solvent effects

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