Institut für Technische Chemie (ITC)
Lehrstuhl für Hochtemperaturverfahrenstechnik
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Bachelor's thesis

Characterization of a tubular reactor system with a built-in fixed bed for the pyrolysis of halogen-containing plastic-based feedstocks

Charakterisierung eines Rohrreaktorsystems mit eingebautem Festbett zur Pyrolyse halogenhaltiger kunststoffbasierter Einsatzstoffe

Issue:
Due to the versatile applications of plastics, the global volume of plastic waste is on the rise, placing an increasing focus on the recycling of these waste streams. Mechanical recycling requires a complex separation of plastics to ensure effective reuse. Additionally, disruptive elements such as halogens, which are either bound to the plastic chain, as in PVC, or introduced through the addition of additives, such as brominated flame retardants (BFR), limit the applicability of the mechanical recycling approach.

The pyrolysis group at ITC researches the chemical recycling of plastic waste through pyrolysis. At temperatures above 300°C in an inert atmosphere, pyrolysis generates gaseous, liquid, and solid products that could serve as secondary raw materials in the petrochemical industry. To study the pyrolysis behavior of halogen-containing, plastic-based feedstocks, a tube reactor with a movable sample boat was designed and scaled, capable of handling up to 10 g of feedstock at pyrolysis temperatures of up to 700°C. The developed system also enables the study of the impact of mineral sorbents on volatile pyrolysis products through an integrated fixed bed. The aim of adding sorbents is the selective removal of halogen-containing molecules from organic pyrolysis products, potentially enhancing product quality and, consequently, the recycling potential.

Description of the work:
The objective of this work is to characterize and validate a system for the pyrolysis of halogen-containing plastic-based feedstocks. For this purpose, a laboratory-scale pyrolysis system is available. The system should allow for mass balancing as well as the generation and collection of products.

You will start by conducting a literature review on the current research status of laboratory-scale tube reactors. The system will then be characterized by analyzing key parameters, such as heating behavior and gas residence time. Parallel to this, you shall develop templates for experiment preparation and evaluation. Finally, the suitability of the system for the above purposes shall be assessed.

Personal qualifications:
You are currently doing your Bachelor's in Chemical Engineering/Process Engineering or a similar field.
Interest in interdisciplinary topics, research, and experimental work.

Language:	English or German
Starting:	Immediately
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