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Bachelor's thesis

Testing of various sorbents in the pyrolysis of flame-retarded polymers

Erprobung verschiedener Sorbentien bei der Pyrolyse von flammgeschützten Polymeren

Problem statement:
Due to the wide range of applications of plastics, the global generation of plastic waste continues to increase. As a result, the recycling of this waste has become an area of growing focus. Mechanical recycling requires elaborate separation of plastics to ensure meaningful reuse. In addition, disruptive elements such as bromine – introduced through the use of brominated flame retardants (BFRs) – further limit the applicability of mechanical recycling approaches.

The Pyrolysis Group at the ITC investigates the chemical recycling of plastic waste via pyrolysis. At temperatures above 300 °C in an inert atmosphere, pyrolysis produces gaseous, liquid, and solid products that could serve as secondary raw materials for the petrochemical industry. To study the pyrolysis behavior of flame-retarded polymers, a tubular reactor with a movable sample boat (capacity up to 10 g feedstock, pyrolysis temperatures up to 700 °C) was constructed and commissioned. The reactor also enables the investigation of the influence of mineral sorbents on volatile pyrolysis products using a built-in fixed bed. The aim of sorbent addition is the selective removal of bromine from the organic pyrolysis products, thereby potentially improving product quality and increasing the recycling potential.

Description of the work:
The aim of this work is to investigate various sorbents with regard to their suitability for bromine removal from pyrolysis vapors. For this purpose, a laboratory-scale pyrolysis system is available. The system enables both the establishment of mass balances and the generation and collection of the resulting products.

The work will begin with a literature review of the current state of research on bromine removal using sorbents. Building on this, different sorbents will be experimentally tested. Particular attention will be given to their effects on product distribution and gas composition. Finally, the suitability of the sorbents for the stated objectives will be evaluated.

Personal qualifications:
Bachelor's student in Chemical Engineering/Process Engineering or a comparable field.
Interest in interdisciplinary topics, literature research, and experimental work.

Language:	English or German
Start:	As of 15.10.2025
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