Optimal Chain for Efficient and AdvaNced Recycling of Mixed Plastic

Publieke samenvatting / Public summary

Aanleiding

Chemical recycling of mixed plastics waste (MPW), to create a circular feedstock for recycled content in new polyolefin plastic products, is still far from mature and optimized. Major issues in this chain start with both the quantity and quality of MPW currently available as feedstock for pyrolysis. The chain would benefit from a constant and larger supply of MPW feedstocks with high content of mixed polyolefins (MPO) and low content of contaminants. This would allow for less complicated and lowercost operation of the pyrolysis process and higher income due to a higher yield on liquids. Further down the chain, low-impurity pyrolysis liquids would allow for less intensive and less costly posttreatment preceding the cracker. Additionally, the availability of large streams of low-impurity pyrolysis liquids would increase the output of olefins from the cracker, assigned to circular origin by mass-balancing. These effects would allow this feedstock stream to become a true commodity, that can be handled, transported, stored, traded and exported without major regulatory obstructions and this would positively contribute to the economics of the whole chain.

Doelstelling

This research project's major objective is to evaluate optimization of the chemical recycling chain, by investigating the integration of two novel pre-treatment processes, the that will be applied on residual MPW streams from sorting plants. The project aims to experimentally test how much MPO

Projectinformatie / Project information

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Algemene informatie / General information

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content can be increased and how much impurity levels can be decreased, for this feedstock destined for pyrolysis. The project aims to study operation and performance of the pyrolysis process for varying parameters, when using pre-treated samples as feedstock, and to determine the residual impurity levels in the pyrolysis liquids that are obtained. The results serve as input for a technoeconomic evaluation of the optimal configuration of chemical recycling chain and for the identification of the preferred location of the pre-treatment process. This study aims to unlock the use of other MPW feedstocks with a high MPO content, that are currently not yet considered as feedstock for pyrolysis, and to determine whether the resulting low-impurity pyrolysis liquids can become a true commodity feedstock.

Korte omschrijving

1. Waste plastics sorters Attero and Renewi will supply MPW samples from packaging sorting residue (DKR350) and from construction and demolishing waste, part of this material will be subjected to a 'dry wash' step, with support from BCC on sampling. 2. TNO will determine experimentally for these MPW samples what levels of MPO enrichment and of decontamination can be achieved by applying two novel pre-treatment processes, when these are scaled-up to kg-level, with support from BCC on analysis. 3. University Maastricht will determine experimentally for different MPO-feedstocks how different levels of MPO and of impurities influence the operation and performance of the pyrolysis process and what kind of residual contaminant levels in the pyrolysis liquids can be obtained, with support from BCC on analysis. 4. Sitech will lead a techno-economic evaluation study on the optimal configuration of the chemical recycling chain and on the preferred location of the pre-treatment steps, supported by Sabic, TNO, Attero and Renewi.

Resultaat

- Report on experimental results from the study by TNO on the use of MPW from plastic waste sorters Attero (packaging sorting residue DKR350) and Renewi (film fraction from construction and

demolishing) as feedstock for two novel pre-treatment processes, scaled-up to kg-level, including results of analysis of samples on MPO content and on contaminant levels, supported by BCC. - Report on experimental results from the study at University Maastricht on operation and performance of the pyrolysis reactor at laboratory scale (100g-level), under various operating conditions (with advice from Sabic). This study includes feeding to the pyrolysis reactor with samples of MPO-rich feedstocks, obtained after pre-treatment, and analysis of collected samples of the pyrolysis liquids to determine yield and composition, supported by BCC. - Report on the results of the techno-economic evaluation study lead by Sitech, to determine the optimal configuration and position of the process steps to obtain MPO-rich feedstock for pyrolysis, based on the experimental results obtained in this project, supported by Sabic, TNO, Attero and Renewi.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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