

Microplastics in plastic recycling

Publieke samenvatting / Public summary

Aanleiding

Nederland Circulair 2050 aims for full circularity by 2050, focusing on plastics, however only 15% is currently recycled into high-end applications. The Growth Fund Circular Plastics aim to increase this percentage. Plastic recycling, both mechanical and chemical, generates microplastics. The European Commission is taking measures against microplastic release, and at the same time the EC is determining the most appropriate measures to further reduce microplastics emission to the environment. The EU has noted recycling as a potential source of microplastics. Quantitative data on microplastics is crucial for the Netherlands' recycling industry and policymakers. The project Losses and Emissions in Plastic Recycling, involving NTCP, ISPT, TNO, and Wetsus, has identified key processes that generate microplastics and effective mitigation methods like dissolved air flotation. MiPlaR will build on this, focusing on quantification and recovery of microplastics. In this project we will explore multiple packaging plastics. The project aligns with UN SDGs 12 and 6, aiming to increase recycling rates, reduce emissions, and improve water quality by reducing pollution and untreated wastewater

Doelstelling

Within the MiPlaR project, our focus is on supporting the recycling industry both in the Netherlands and internationally to minimize losses and emissions resulting from the formation and release of microplastics. To achieve this, we aim to identify and quantify microplastics throughout the recycling chain, enabling: Reduction of microplastic generation in recycling processes for various sorted

Projectinformatie / Project information

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Algemene informatie / General information

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plastic packaging waste streams by: • understanding the properties (size, shape, density) of formed microplastics and their distribution throughout the recycling process; • optimizing process settings and implementing potential process design changes; • adjusting the order of process steps; • selecting better material (grade, processing condition) and product (design) properties for specific packaging applications. Prevention of microplastics entering the environment by: • recovering generated microplastics in recycling processes for reuse in other recycling processes; • implementing water treatment methods to capture microplastics, including the smallest particles.

Korte omschrijving

We will examine various unit operations and process designs in recycling, benchmarking typical packaging plastics for microplastics formation. NTCP will perform this on their modular real scale recycling facilities. Additionally, we will develop sampling and standardized analytical tools, building upon our previous work in the LEmPlaR project. Our experimental work also considers the properties of material, (product) design and ink removal in relation to microplastics formation during recycling. After identifying the key microplastic-generating unit operations, we will develop mitigations and conduct two types of trials to validate these: • Adjusting process parameters and settings of existing reprocessing equipment; • Implementing design changes in equipment to reduce microplastics formation. We will develop rapid, at-line measurement (estimation) techniques for microplastics. The project will evaluate and benchmark conventional mechanical recycling wastewater treatment processes for microplastic removal and wastewater quality. We will also identify and optimize candidate processes for microplastic removal and develop a proof-of-concept for a novel highthroughput filter.

Resultaat

The main plastic packaging materials in the Netherlands are PP, PE, and PET. Our previous study

established a detailed mass balance for the mechanical recycling of PP from household packaging waste, revealing that most losses are in the form of microplastics. Using this study as a reference, we will deliver benchmarks of HDPE, PET trays and mixed plastics (DKR350/352, containing PE, PP, PET, PS, PA) with state-of-the-art recycling processes. Packaging printing involves polymeric ink binders that generate microplastics during deinking. We will investigate the fate of inks in plastic recycling on a bench scale, using direct print on PP as a relevant case. Following benchmarking, we will explore potential mitigation actions and deliver proofs of concept. The project will additionally result in standardized sampling methods for industry use and analytical methods for inline or at-line application in recycling installations. Our findings will be disseminated to the recycling industry, policy makers, and the scientific community. We plan to publish several peer-reviewed articles.

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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