

Monitoring Quality in Plastic Recycling

Publieke samenvatting / Public summary

Aanleiding

In the plastic value chain there is only limited information available on the plastics in that chain to assess circularity and recyclability goals, especially the use of PCR in packaging as defined in e.g. the Packaging and Packaging Waste Regulation. For the stakeholder this leads to a situation where making choices on processes and technologies is difficult. A major challenge when it comes to monitoring the quality of plastics along the value chain, is that actual data is missing or very limited in a large number of steps along the process flow. Specification and standardisation of materials is common in certain industries like chemistry and pharma but is at this point only in an infancy state in plastic waste management. Plastic recycling goals have not received focus on recyclate quality which is partly due to the way recycling rates have been calculated until 2022: any material stream coming out of a plastic sorting plant is considered recycled independent of the actual subsequent recycling process. This is now changing a bit with measuring the so-called washed and dried flake but is still far from complete and definitely not yet suitable for PCR quality prediction.

Doelstelling

In this project, we focus on the necessary quality monitoring tools and the application of existing models related to the prediction of recyclate quality in order to increase the use of PCR in packaging. An integral approach should allow adjustment along the circular value chain to improve PCR quality. 1. The results will enable quality monitoring along the mechanical recycling chain for postconsumer plastic

Projectinformatie / Project information

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Algemene informatie / General information

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packaging waste by ways of a collection of suitable in-line characterisation technologies. We will make a distinction between the different relevant process steps in the recycling chain: sorting, pre-treatment, reprocessing, and extrusion. 2. The results will enable and validate the use of existing recyclate quality predicting models (RQ and QMRP) with the acquired data from the monitoring methods. In addition, these models will be used to assess substitutability of virgin plastic by recyclate. 3. The project results will set the stage for steering the recycling processes based on quality data along the chain. The in-line methods should enable application-based routing for certain materials along the recycling chain.

Korte omschrijving

The project will be divided in four work packages: 1. Sorting, pre-treatment, and reprocessing (NTCP). Exploring and developing inline and atline measurement methods in the mentioned processes at relevant scale. This includes NIR/RGB stream analysis, NIR moisture analysis, surface contamination analysis, particles in water and air, COD, BOD etc. in wastewater, flake analysis on material and colour. Showing the developed inline and at-line methods at industrial scale in the sorting, pre-treatment, and reprocessing steps. 2. Mechanical recycling (UM-CCE). Exploring and developing inline methods in the extrusion process of recycling. This includes inline rheometry, Raman spectroscopy, and gas chromatography for NIAS and IAS. Showing the developed inline and at-line methods at industrial scale in the extrusion steps. 3. Model application (UM-CCE). Using existing, mainly public, models (e.g. RQ, QMRP, RecyQMeter) around the prediction of recyclate quality using the data collected in the project. 4. Knowledge dissemination (NTCP). Making the developed methods and findings available to the community. 5. Technical project lead (NTCP). Leading the technical content of the project.

Resultaat

To reach the set objectives, we have identified three separate set of results in the project. Overview of

mechanical recycling chain: • Waste composition • Unit operations • Quality parameters • Potential measurements • Effect of certain parameters on recyclate quality Monitoring methods along the recycling chain: • Method description and results for different processes in the chain (grouped per process) • Predictive potential of the methods • Implementation plan per method • Link to existing models Proof-of-concept demonstration with use case(s): • Selected material recycling: PP rigid and HDPE • Industrial scale • Demonstration at pilots or at industry • Scalability assessment • TRL 6-7

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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