LABORATORY FOR CHEMICAL TECHNOLOGY
Technologiepark 125, 9052 Gent, Belgium

Supervisor(s)	**Period**	**Funding**
Prof. Kevin Van Geem Dr. Florence Vermeire	4-year PhD project	VLAIO

Vacancy for PhD Position: Chemical Recycling of Oxygenated Waste Polymers

Aim

The aim of this PhD project is to screen heterogenous catalysts and study the influence of impurities on the catalytic upgrading of plastic waste. This research will focus on the use of advanced characterization techniques and dedicated experimental units to optimize the conversion of oxygenated waste polymers to high added value diols and polyols for repolymerization into novel epoxy resins with improved recyclability. Experimental measurements will be used for the validation of detailed kinetic models and multi-scale reactor models in collaboration with a diverse team of researchers.

Justification

Chemical recycling of plastic waste is the crucial step to reduce carbon emissions and to achieve a circular economy for plastics. The complex composition of plastic waste makes the recycling of those plastics challenging. Plastic waste if often a mixture of different polymers with the presence of various additives and impurities, instead of the pure polymer stream that is required for conventional recycling processes. The most common approach to reprocessing plastics is mechanical recycling. In this process, thermoplastics are recycled by mechanical operations towards various alternative applications of the plastics. However, the high feedstock purity requirement and the reduced quality of the recycled plastics limit the applicability domain of this process. To close the loop towards a circular economy, chemical recycling of plastic waste to their base chemicals or original monomeric units is required. The chemical decomposition of plastic waste by catalytic pyrolysis or reductive depolymerization has significant potential to complement mechanical recycling and to achieve this goal on an industrial scale.

Program

There will be a number of tasks in this research project

1. Detailed characterization of the mixed plastic waste feedstock, including elemental composition and the presence of impurities.
2. Heterogeneous catalyst preparation and characterization using experimental techniques such as electron microscopy, nitrogen physisorption, X-ray diffraction, infrared spectroscopy, ….
3. Screening of catalysts and process conditions during the catalytic upgrading of the mixed plastic waste stream in a micro-pyrolysis experimental unit with detailed product characterization. Experimental study of the intrinsic kinetics of the reductive depolymerization in a Robinson-Mahoney reactor.
4. Use of intrinsic kinetic measurements for the development of a fundamental kinetic model. The kinetic model will further be used for implementation in a multi-scale reactor model.

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