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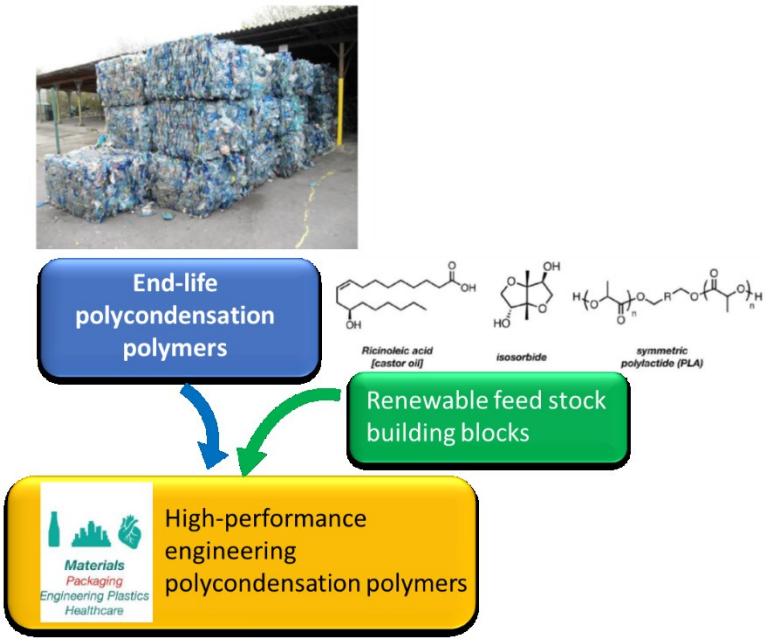
Toward achieving circularity for polycondensation products via combining experiments and simulation

Aim

Model-guided optimization of polycondensation polymers recycling.

Justification

10 % of worldwide plastic production is represented by polycondensation polymers, such as polyamides, polyesters, polyurethanes and polycarbonates. The societal challenge is to make these types of plastics sustainable meaning either efficient recycling of polymer wastes and application of sustainable feedstocks for polymer production.



The main focus of this project is the optimization of operation conditions for chemical recycling of polyamides and polyethylene terephatate for the production of high-added-value building blocks for new materials. For that, computer-model aided process design should be performed on the basis of experimental data for novel catalytic systems developed by KU Leuven which is the partner organization in this project.

At the first stage of the project the depolymerization process of polyethylene terephtalate will be considered. Special attention will be paid to the formation of recycling products that could further react with bio-based building block to form industrial engineering copolyesters. Prime examples of comonomers from biobased sources that we will consider to combine with PET recyclate are succinic acid, derivatives from castor oil, dimerized fatty acids.

Program

1. Exploring the possibility of end-of-life PET usage as a possible feedstock for novel polycondensation polymers. Surveying the literature for possible reaction mechanisms for chemical recycling.
2. Literature study of sustainable building blocks for polycondensation with PET recycling products.
3. Development of a computer model for the efficient model-assisted repolymerization.
4. Validating the model against the experimental data.
5. Adaptation of an existing computer model to simulate polycondensation of PET recycling products with bio-based building blocks.

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