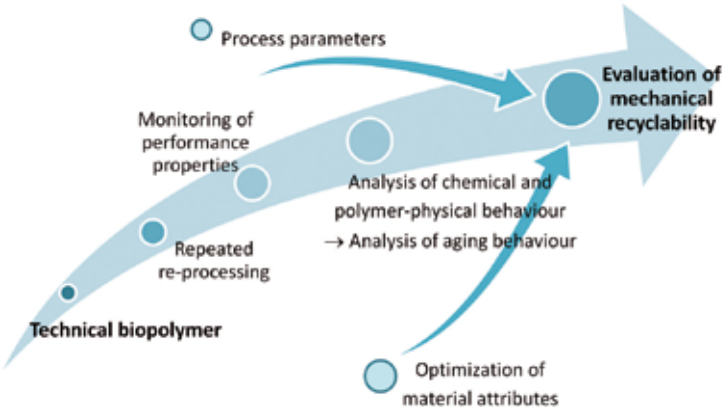
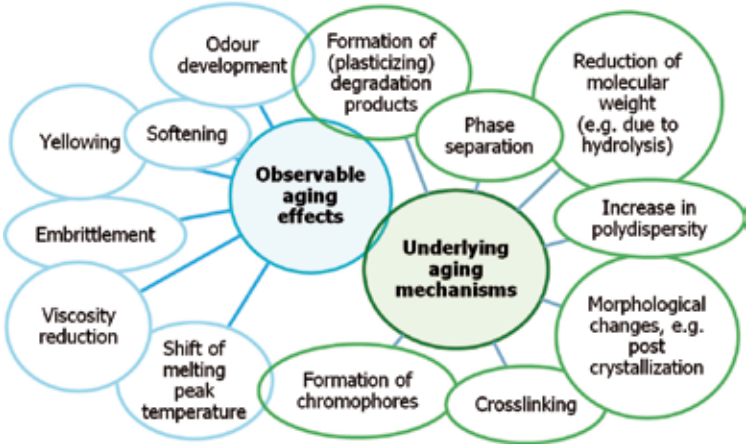
Mechanical Recyclability of Technical Biopolymers

The biopolymer market shows a continuing strong growth. Hence, analysis and optimization of mechanical recycling as end-of-life option is of major interest to ensure longterm sustainability.

Sustainable waste management of bio-based polymers must be tackled early on. Thus, as to simulate mechanical recycling, nominated biopolymers (polytrimethylene terephthalate, polybutylene succinate, cellulose acetate butyrate, biobased polyamide and a polyhydroxy alkanoate blend) were subjected to repeated processing and continuously characterized regarding their aging behaviour. Consequently, their mechanical recyclability was evaluated and optimization possibilities were suggested.



Typical aging phenomena induced by mechanical recycling



Most of the investigated biopolymers retained their performance characteristics to a large extent for up to five reprocessing cycles. Due to their chemical structure, typically the predominant aging mechanism observed for biopolymers is hydrolysis, leading to a decrease in molecular weight.

Yet, concisely, the mechanical recyclability of biopolymers seems to be encouragingly high and might further be enhanced by process and material optimization (e.g. stabilization).

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PCCL
Polymer Competence Center Leoben

COMET
Competence Centers for Excellent Technologies

Personal Data:
2008-2013: Study of Polymer Engineering and Science (MUL)
2013: Master thesis at the UOW (Australia)
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Research Focus:
Biopolymers, recycling, sustainability;
material testing with sample preparation (focus on morphological analysis)