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MECHANICAL RECYCLING OF TECHNICAL BIOPOLYMERS

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Technical biopolymers, i.e. plastics that are biodegradable and/or renewably resourced are becoming increasingly attractive as both, sustainable and well-performing polymeric materials. Until 2020 such plastics are predicted to account for 25-30% of the feedstock of all polymer products. To ensure the sustainability of technical biopolymers in the long term, the mechanical recycling of these plastics is crucial. Thus, in the present study, the mechanical recyclability of the technical biopolymers polytrimethylene terephthalate, cellulose acetate butyrate, polybutylene succinate, and polyhydroxyalkanoate blend is investigated and evaluated. The industrial mechanical recycling is simulated by repeated polymer processing (extrusion) for up to seven times. After each reprocessing cycle, a comprehensive polymer-physical property profile is generated. The reprocessing-induced aging mechanisms and potential material degradation are assessed and correlated with the changes in the mechanical performance characteristics. A hydrolytic degradation is shown to be the prevalent aging mechanism of the investigated biopolymer grades. However, the susceptibility to hydrolysis and thus the maintenance of the performance characteristics differs strongly between the analyzed biopolymer types. Generally, the study reveals a high potential of the investigated technical biopolymers regarding mechanical recycling.

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