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Feasibility Study of the PET Fines Incorporation into Recycling Processes

Conference paper | First Online: 27 February 2023

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Abstract

Circular economy principles focus on the need to preserve natural resources and foster the use of environmentally sustainable practices. Concerning the use of plastics in a circular economy, increasingly demanding solutions have to be developed towards the zero-waste goal sought after by researchers and society alike. Particular attention has been put into the recycling of PET, mainly due to its wide spectrum of use and, consequently, to large volumes of related waste. The PET mechanical recycling process requires these waste materials to be shredded into PET flakes. Following such a procedure, these flakes are pelletized to be used again as feedstock. Considering the main stages of the mechanical recycling processes, which include plastic screening, shredding and washing, significant amounts of end waste materials are generated. This end-waste integrates small scale particles that are designated by plastic fines. Concerning the PET recycling process, the PET fines resulting from its mechanical recycling are not currently valued due to several technical issues, such as their high contamination level and the complexity of sorting them from other small-size particles. Current research focuses on the feasibility of incorporating these PET fines into the film/injection extruders, avoiding this way the need for an intermediate pelletization stage. To allow for such direct incorporation of PET fines into recycling processes, different decontamination and sorting solutions were implemented and tested. The current study is based on analyzing the mechanical properties of PET fines, using laboratory tests such as FTIR, DSC, MFI, moisture content, tensile tests and bending tests. Preliminary results allow foreseeing the successful direct incorporation of PET fines into PET recycling.