New fast compostable polymer without leaving any traces of microplastic

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Abstract

New material solutions to the microplastics (MP) problem originating from packaging are urgently needed as they reach industrial compost plants when disposed of together with food waste and reach the natural environment in huge amounts when carelessly disposed of by people worldwide. We present one of the fastest composting aliphatic-aromatic polyesters with a good balance of mechanical and barrier properties, making it a promising alternative for low-density polyethylene in packaging. The new polyesters are prepared by melt polycondensation reactions. One of the compositions exhibited a tensile strength of 20 ± 2 MPa, modulus of 150 ± 8 MPa, and a very high elongation at a break of 581 ± 46 %. The low oxygen transmission rate (152 cm3m–2day–1bar–1) measured at 65% relative humidity and 23 ∘C confirms excellent barrier performance. Enzyme-catalyzed hydrolysis under controlled conditions, the full fragmentation, assimilation, and mineralization in thermophilic, aerobic composting could be confirmed in less than five weeks using a combination of different analytical methods. The mechanism of degradation was proven to be bulk degradation. The presentation will cover synthetic, structural characterization, and detailed degradation studies showing the MP-free compost after the degradation of the polymer.

Keywords: Polyester, Biodegradable, Polycondensation, Composting, Hydrolysis

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