

Biocompatible Polymer Development

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Towards Sustainable Polymer Recycling: Green Chemistry Solutions for Eco-Friendly Production of High-Quality Polymers from Plastic Waste

The primary recycling methods used today rely on the mechanical recycling of plastic waste; however, even this method is constrained by the requirement to analyse and pretreat the waste plastic and the gradual degradation of plastics in the process. Production of feedstocks from plastic waste can be recycled using green chemistry as an alternative upgrade to mechanical procedures for a variety of applications, such as fuels and chemical feedstocks to replace petrochemicals. The highly toxic solvents and chemicals utilized in the present chemical recycling processes are extremely dangerous to both the environment and human health. Due to the afore mentioned challenges, the primary objective of Necdet Özçelik's thesis is to green chemically recycle polymers that are commonly used in industry, such as polyesters polyolefins, polyamide, polystyrene, and polyethylene terephthalate. The goal is to synthesize the same polymer while maintaining its strength and chemical characteristics through the usage of recycled monomers. As a result, monomers from recycling will be used for the production of polymers rather than monomers from fossil fuels. In addition, this thesis aims to carry out recycling methods in a way that minimizes environmental harm and, if possible, excludes solvents by using reactive extrusion and microwave processes to implement the procedure to industrial scale recycling.