Abstract
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Poly(butylene adipate-co-terephthalate) (PBAT) is a copolymer of adipic acid, 1,4-butanediol, and terephthalic acid, well-known for its combined properties of flexibility, toughness, and biodegradability that arise from its synergistic aliphatic and aromatic subunits. Despite being biodegradable, it is still produced from petrochemical-based feedstocks on the industrial level, hampering its ability to do good for the environment. To address this, we implemented a method of combining the decomposition products of polyester terephthalate (PET) and polyethylene (PE) to create copolymers with key similarities to PBAT. Methods of chemically recycling PE and PET have been adopted from previous papers, which respectively degrade PE and PET into dicarboxylic acids of varying carbon count and the diol bis(4-hydroxybutyl)terephthalate (BHBT).[1,2] Herein we show that the polycondensation of a dicarboxylic acid with BHBT results in a PBAT-like polymer of pronounced molecular weight and physicochemical properties comparable to actual PBAT. Our method capitalizes on the wide range of monomers obtained from PET and PE degradation, allowing for the tailoring of physicochemical properties in resultant PBAT analogues. Overall, this method opens the door for a new library of upcycled and biodegradable materials, giving a second life to millions of tons of post-consumer PET and PE and reducing economic dependence on petrochemical feedstocks.

References:

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2. Sullivan, K. P. et al. Mixed Plastics Waste Valorization Through Tandem Chemical Oxidation and Biological Funneling. *Science.* **2022**, *378* (6616), 207-211. DOI: 10.1126/science.abo4626.