Área: ORG

Upcycling of itaconic acid and formamide for the synthesis of biobased branched polyesters

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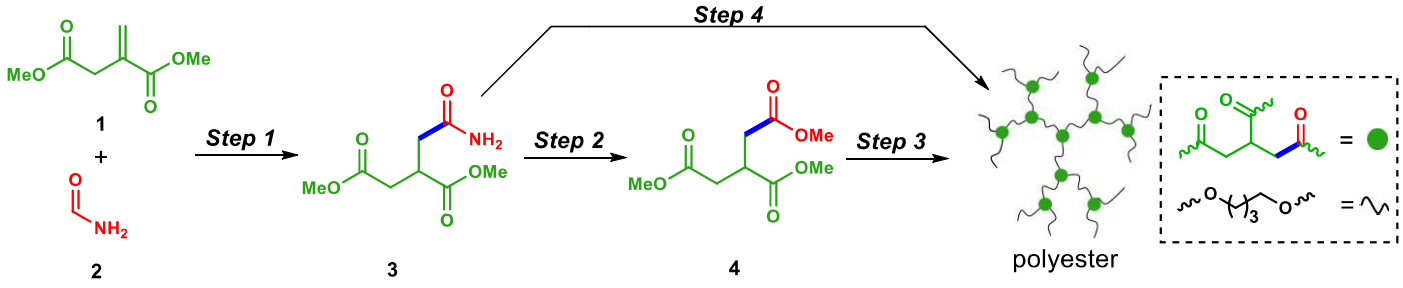
Highlights

Upgrading of itaconic acid and formamide for production of high value-added products.

Synthesis of renewable polyesters.

Abstract

Polymers are essential components of our daily lives, but most of them are obtained from fossil sources and are major contributors to environmental pollution. Therefore, biodegradable and renewable starting materials are being sought, such as itaconic acid (IA), a compound obtained through biomass. For this purpose, the photocarbamoylation of the IA's dimethyl ester (**1,** DMI) under continuous flow conditions (**Step 1**) [1] was optimized varying the concentration of DMI, formamide and the catalyst (TBADT, 1-6 mol%), as well as the retention time and the lamps power. Then, the amide-ester (**3**) was submitted to an alcoholysis of the amide group (**Step 2**), in which methanol acts as solvent and reactant, resulting in the triester (**4**). Different catalysts were evaluated for this reaction, such as Bronsted and Lewis acids and bases, and once *p*-toluenesulfonic acid (PTSA) was chosen, different temperatures and reaction times were also evaluated. The polyester can be either synthetized using the isolated triester (**Step 3**) or via a one-pot strategy (**Step 4**), since the polymerization catalyst is also PTSA. The polyester was obtained through a one-pot reaction of the amide-ester (**3**) and 1,4-butanediol. Initially, the mixture was stirred for 18 h at 100 ºC for the amide alcoholysis and transesterification, then 8 h at 190 ºC for the polymeric chain elongation.



[1] Rocha B. C., et. Al. *Green. Chem.*, **2024**, n. 12, v. 26, p. 7019.

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