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Alternating copolymerization of epoxides with anhydrides initiated by organic bases

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ABSTRACT

Simple organic bases were explored as metal-free initiators for the copolymerization of epoxides with anhydrides. A comprehensive study encompassing the effect of solvent, temperature, concentration and purity of reactants was performed to find optimal conditions for achieving the highest catalytic performance. Detailed MALDI-TOF study elucidated the microstructure of obtained copolymers and confirmed the presence of two types of initiating species derived from organic base and diacid impurity from anhydride. Kinetic studies confirmed controlled manner of the copolymerization and further clarified the mechanism of polymerization. Among all tested initiators, bis(triphenylphosphine iminium)chloride (PPNCl) proved to be the most efficient initiator, which produced highly alternating polyesters with molar masses up to 21 kg.mol⁻¹. Crucial role of monomer impurities on achievable molar mass of polyesters was proven. The versatility of PPNCl as an initiator was further demonstrated by the copolymerization of various epoxides and anhydrides producing large scope of polyesters.

KEYWORDS

Copolymerization, epoxides, anhydrides, organic bases, MALDI-TOF, kinetic study

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