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Architectural control of isosorbide-based polyethers via ring-opening polymerization

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PURPOSE OF THE ABSTRACT
Isosorbide is an inexpensive building block derivative from sorbitol, which can impart high glass transition temperatures into polymeric materials. Isosorbide has been used in many types of polymerizations including polyesters, polycarbonates, polyethers, polyamides, and polyurethanes usually via step-growth methods. Polymeric materials containing isosorbide have been shown to enable excellent properties including good optical clarity and strong resistance to UV, heat, impact, and abrasion. These properties make isosorbide an interesting, sustainable candidate for a wide variety of applications such as packaging, electronic displays, and biomedical applications.

Herein, a controlled polymerization route with isosorbide has been demonstrated and we provide mechanistic insights into cationic and quasi- zwitterionic ring-opening polymerization of an annulated isosorbide derivative (1,4:2,5:3,6-trianhydro-D-mannitol). Ring-opening selectivity of this tricyclic ether was achieved via modulating reaction conditions, which directed selectivity towards different macromolecular architectures, allowing for formation of either linear or cyclic polymers. Notably, straightforward recycling of unreacted monomer can be accomplished via sublimation. This work provides the first platform for tailored polymer architectures from isosorbide via ring-opening polymerization.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

BIBLIOGRAPHY