



Isosorbide-based Methacrylate Monomer for High Tg Polymers (20150148, Dr. Marc Hillmyer)

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Isosorbide Derivative

A new isosorbide derivative has been synthesized which can be polymerized and incorporated into block polymers. The monomer, AMI (acetylated methacrylic isosorbide), can be efficiently synthesized in two steps from commercially available starting materials. It can be polymerized using a variety of methods including traditional free radical and Reversible Addition-Fragmentation chain Transfer (RAFT) polymerizations. The resulting polymers are isosorbide-based polymethacrylates. Additional research focusing on thermoplastic elastomer applications is on-going.

High-Tg Polymer from Renewable Isosorbide

Currently, almost all commercially available high-Tg polymers are derived from nonrenewable, petroleum-based feedstocks. However, using biorenewable sugar derivatives such as isosorbide is becoming increasingly cost effective over petroleum-based analogs. Furthermore, these sugar derivatives are chemically rigid and functional, making them highly desired as biobased polymer building blocks. Isosorbide has been used in a wide variety of polymers, including polyesters, polycarbonates, polyethers and polyurethanes, and its structure and functionality is often compared to bisphenol A (BPA).

Features and Benefits:

- Simple synthesis
- Controlled polymerizations
- Isosorbide based block polymers
- High glass transition temperature ($T_g \approx 130\text{ }^{\circ}\text{C}$)
- Good thermal stability ($T_d = 251\text{ }^{\circ}\text{C}$)

Potential Applications:

- Biobased polymer
- Methylmethacrylate replacement
- Adhesives
- Coatings
- Thermoplastic elastomers

Phase of Development Proof of Concept

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