



# Biorenewable Alternative to Polyacrylates

## Polymers from Glucose

An environmentally friendly process has been developed for the synthesis of isoprenecarboxylic esters and their corresponding polymers from a fermentation product of glucose: mevalonolactone. In this method, bio-renewable mevalonate is used to synthesize mevalonolactone, which can then be converted to anhydromevalonolactone. An eliminative opening of anhydromevalonolactone using a base like tert-butoxide creates the precursor to isoprenecarboxylic esters (e.g., methyl, ethyl, n-butyl, and t-butyl derivatives) with different sizes of the ester alkyl moiety. The final step is radical polymerization of these esters or the precursor acid, using AIBN as initiator, which leads to the ultimate poly(isoprenecarboxylate) product. The varying alkyl ester moiety changes the polymer's properties creating the possibility of polymers suited for a variety of applications.

## "Acrylate-like" Polymers for Hydrogels and Adhesives

Acrylates are commodity chemicals used to make hydrogels and adhesives found in a wide variety of consumer products, but few bio-derived "acrylate-like" monomers are currently available. Like acrylates, this versatile technology can be used to make polymers ranging from soft, tacky polymers to brittle hard plastics. These polymers can be water-resistant or water absorbing depending on the starting monomer used. By using bio-renewable materials, this method offers potential sustainable alternatives to poly(acrylates).

### BENEFITS AND FEATURES:

- Environmentally friendly, "green" process
- Uses glucose as a starting material
- Adjustable polymer properties: the same technology can make soft and tacky materials to hard and brittle or hydrophilic or hydrophobic materials

### APPLICATIONS:

- Hydrogels for:
  - Thickening agents
  - Super absorbent materials
  - Disposable diapers
  - Feminine products
  - Hair gels
  - Shampoo/cosmetics
- Pressure sensitive adhesives

**Phase of Development** - Proof of Concept

## Researchers

Thomas R. Hoye, PhD

*Professor, Department of Chemistry*

## Technology ID

20170023

## Category

Engineering & Physical  
Sciences/Materials

Engineering & Physical  
Sciences/Sustainable Technology

## Learn more



[External Link](#) (chem.umn.edu)

Nicolas Ball-Jones, PhD

*Postdoctoral Associate, Department of Chemistry*

Grant W. Fahnhorst

*Research Associate, Department of Chemistry*

## **Publications**

[\*Poly\(isoprenecarboxylates\) from Glucose via Anhydromevalonolactone\*](#)

*ACS Macro Letters*, 2016, 5 (10), pp 1128-1131