Biomass Program

Bioproducts R&D

New Sustainable Chemistry for Adhesives, Elastomers and Foams

Biobased polymers offer potential for use as adhesives, foams, and elastomers. This project is developing new materials based on Carbon Michael chemistry applied to derivatives of crop oils and sugars. The addition of reactive functional groups to starting materials, such as soy oil, glycerol, glucose, sorbitol, and isosorbide, yields materials which react to form polymers in the presence of proprietary base catalysts. Researchers aim to develop polymers that match the performance of petroleum-based polyurethanes used in the flexible packaging and assembly industries.

The biobased polymers will eliminate the shortcomings of polyurethanes, which include toxicity, slow cure, and formation of deleterious by-products. Additionally, the biobased materials offer increased price stability relative to that of petroleum-derived polyurethanes.

R&D Pathway

The project is focused on the development and scale-up of biobased reactants and adhesive products for commercial sale to the flexible packaging and assembly industries. Research activities will include:

- Laboratory synthesis and characterization of biobased reactants
- Conversion of the reactants, through Carbon Michael chemistry, to polymers suitable for formulation into prototype adhesives, elastomers, and foams
- Development of polymer structure/property relationships to guide product design and development
- Scale-up of reactants and polymers to produce sufficient quantities for customer testing and commercial sale
- Preparation and characterization of prototype foams and elastomers.

Biobased adhesives for flexible packaging have been processed on a commercial scale coater (pictured) at speeds of 1,000 feet per minute.

Benefits

- **Lower environmental impact than polyurethanes**
- **Offers improved performance, faster cure, increased safety, and greater price stability than polyurethanes**

Applications

With broad-based application in adhesives, foams, and elastomers, these biobased polymers will provide an important pathway to value-added products from integrated biorefineries.

Project Participants

Eastman Chemical Company
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USDA Eastern Regional Research Center
Virginia Polytechnic Institute and State University

Project Period

FY 2005 – FY 2007

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