WiSys Ref: T180065

Biorenewable Elastomers from Biodiesel Production Waste

Market and Background

The market for elastomers is expected to grow annually by 5% through 2024. In addition to an increase demand from markets in the Asia-Pacific, there is a shifting focus in the industry for the development of bio-based products. This reflects the growing need for environmentally friendly polymers as the negative impacts of plastics become more evident. One of the primary compounds in this project is glycerol, which is produced in large quantities as a waste product in biodiesel, soap, and animal rendering industries. The market size for glycerol is expected to reach USD 3 billion by 2022, with increasing demand from personal care, medicine, and other products.

Elastomers are used in many key industries, including automotive; medical; consumer gods; heating, ventilation, and air conditioning; electrical & electronics; construction; and footwear. The chief characteristics are that such materials can repeatedly bend, bounce, flex, and tolerate stresses and return to their original shape and size. The interplay between these positive mechanical properties and degradability is the key to significantly reduce the negative environmental impacts of plastics while maintaining their critical roles to society.

Research and Development Status:

An associate professor of chemistry at Northland College, in partnership with the University of Wisconsin-Eau Claire, has successfully synthesized elastomeric high-molecular weight polycycloacetals derived from diglycerol and *meso*-erythritol. The discussion of which was published in the *Journal of Applied Polymer Science* and can be viewed at this link.

As discovered here, there is a process for turning diglycerol into an elastomer for such lower-grade rubber items like rubber bands. Stress-strain curves for the developed polycycloacetals as compared to a rubber band show the opportunity for optimization. The next steps are to incorporate additives to further enhance their properties, as well their adhesive and degradation properties.

Applications:

Elastomers have a wide range of applications depending on their mechanical properties and grade. The elastomers developed here are of a lower grade and likely best suited for gloves, matting, toy balloons, rubber bands, adhesives, and pencil erasers. The specific applications will be determined through the development process as various additives are evaluated and their mechanical properties are characterized.

Key Benefits:

This is research is concerned with creating new elastomeric materials with degradable properties. Preliminary studies support the potential for chemical recycling of the current materials. The elastomers discovered were created using biorenewable materials that repurpose glycerol, an industrial waste product.

Intellectual Property:

A US patent application is pending for this technology. For more information, please contact Jennifer Souter at jennifer@wisys.org or by phone at 608-316-4131.

Development and Commercialization Needs:

WiSys is seeking partners for further development of elastomeric high-molecular weight polycycloacetals through optimization studies to evaluate different additives and degradation properties. Methods for their synthesis will be refined to scale the process and make it more economical in order to provide a route to market for commercialization.