Megan Robertson, associate professor of chemical and biomolecular engineering, was honored in May with the 2018 Sparks-Thomas Award from the Rubber Division of the American Chemical Society. During the conference in Indianapolis, Robertson presented her latest findings in the field of sustainable elastomers to fellow polymer researchers.

The Sparks-Thomas Award (sponsored by ExxonMobil) has been given since 1986 by the Society’s Rubber Division to an early career scientist, technologist or engineer for outstanding contributions in the field of elastomers. It is named for the developers of butyl rubber, William J. Sparks and Robert M. Thomas.

Robertson's 2018 award honors her research into identifying vegetable oil and fatty acid-based materials that could replace petrochemical products as the basic ingredients in the manufacturing of elastomers. Elastomers are the kind of polymers that can greatly stretch and deform, then quickly revert to their original form. (Think tires and rubber bands, for example.) The goal is to develop new, superior materials that maintain all the benefits of today's products while also being kinder to the environment, as well as to uncover new, advantageous properties.

Traditional elastomers find diverse applications. They are the major components of rubber tires, soft coatings, adhesives, even Silly Putty. They are in the seals that secure the Space Station and the gaskets that keep our home faucets from dripping. The waterproof sealants that plumbers put around pipe joints are made with elastomers. So are silicone devices used by surgeons in an operating room. As beneficial as these polymers are, their traditional form presents some challenges. For one thing, their raw materials are byproducts of petroleum refining, which means they come from a nonrenewable resource that is subject to the troublesome fluctuations of supply and price in world oil markets. For another, they are not particularly earth-friendly in their creation or in their afterlife.

Biorenewable elastomers
Robertson's research group is using vegetable oils and their fatty acids for the development of new elastomers. These relatively abundant biosources have the potential to replace traditional petrochemical sources for polymers.

"If elastomers could be made from biosources instead of petroleum, there is the potential to greatly reduce their environmental footprint," she explained. Robertson's research has emphasized a specific type of elastomer called a thermoplastic elastomer. Unlike traditional elastomers, thermoplastic elastomers can be reshaped into new forms at elevated temperatures, allowing for their on-the-spot application as well as re-purposing into new products. Thus, the biobased thermoplastic elastomers that Robertson is developing not only come from a renewable resource, but could also be potentially recycled after their use.

However, developing new polymers is not an easy task. Starting with a bioresource for polymers often results in materials with very different properties compared to the traditional materials. This presents many challenges for adoption of these materials in applications.

Robertson's group is investigating methods of overcoming such limitations for vegetable oil-based elastomers. As one example, the biobased elastomers show lower strength than traditional elastomers, and Robertson's group is developing methods to strengthen these polymers. Thus, the biobased elastomers of the future may not only be more earth-friendly than the current petroleum-based status quo, they might be stronger, too. For now, the enticing benefits are in the future while today's research is aimed at exploring the potentials. That research is very promising.

**More milestones**

Robertson had a busy year in 2017, with her calendar filled with major professional and personal milestones.

She was honored at the 2017 American Chemical Society's Young Investigator Symposium, hosted by the Polymeric Materials: Science and Engineering Division. For the symposium, she was invited to join other young scientists in discussing their individual research findings. But that time, she accepted the honors long distance and stayed in Houston to await the birth of her son just weeks later.

Additionally, the UH Undergraduate Research Mentor Award in 2017 honored her talent in guiding young scientists. "We work with many undergraduate investigators in our group, and we are quite proud of their accomplishments," she said.

The pace has not slowed this year, as Robertson and her group continue to explore game-changing science.