Video: 'Yellow chemistry' turns sulfur waste into plastics

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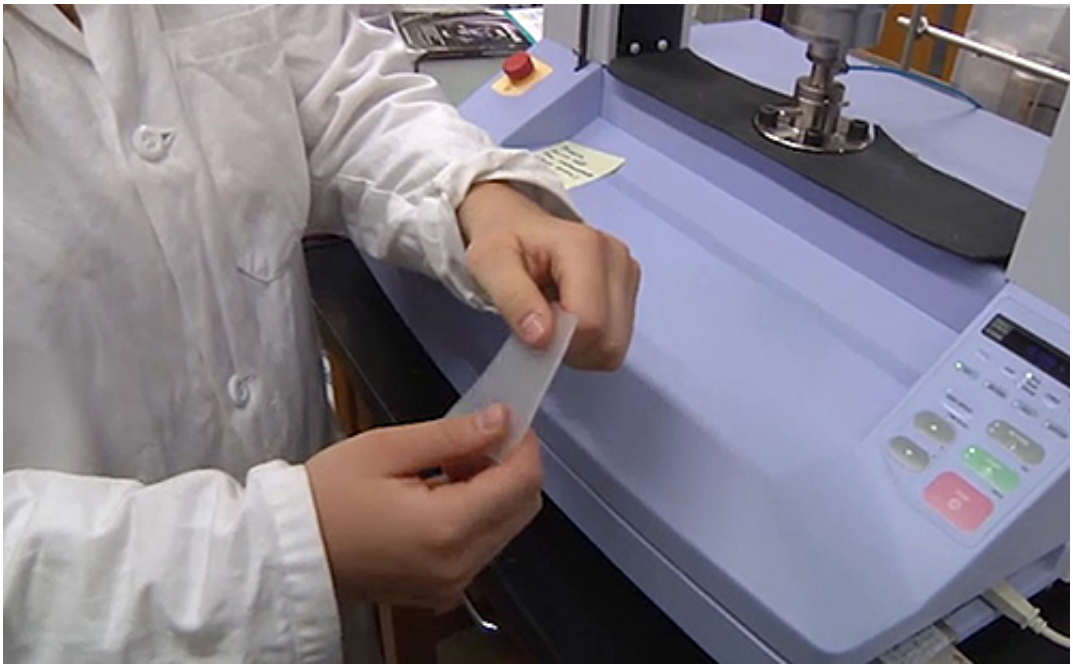

As people grow more concerned about throwaways destined for landfills (or worse, for the open ocean) and the problems associated with fossil fuels, businesses of all sizes are looking beyond "traditional," petroleum-based plastics to alternatives derived from plants, or even synthesized by microorganisms. Bioplastics are made wholly or in part from renewable biomass sources such as sugarcane and corn, or from the digest of microbes such as yeast. Some bioplastics are biodegradable or even compostable, under the right conditions. These new, more eco-friendly plastics are cropping up in all sorts of places, from tea bags to 3-D printing media to medical implants. Different kinds of plastic will have varying polymer structures and distinct properties (toughness, stiffness, strength, transparency, etc.). Manufacturers then buy those bulk polymer pellets, granules or liquids for creating plastic in different shapes using processes such as

extrusion or injection molding. The push to use alternative, more renewable feed stocks rests on increasing concerns about the impact of petrochemicals on health and the environment, as well as the wariness people feel about relying on finite fossil-fuel resources. Many petroleum-based plastics don't break down for hundreds, or even thousands, of years--the carbon-carbon bonds that form the polymers are that durable. Researchers working with businesses are challenged to make a material that will not only be biodegradable and nontoxic, but also cost-effective. Find out more in this discovery. Credit: National Science Foundation

While many scientists are hard at work on "green chemistry" projects that will benefit the environment, there are a handful of researchers at the University of Arizona who are starting a trend of their own—"yellow chemistry." That's because their main ingredient is sulfur, a yellow waste product from petroleum refining and natural gas production.

With support from the National Science Foundation (NSF), chemists Jeff Pyun and Richard Glass and a team of collaborators have mixed up a chemical recipe for sulfur-based plastic, and they've already used it to make everything from toys and lenses to a 45 record. But, ultimately, they're thinking of much bigger applications with this new class of plastics.

Pyun says the annual production of sulfur is approximately 70 million tons per year, the majority of which comes from oil and gas production. While much of that is used up making sulfuric acid and fertilizer, there are still millions of tons left over.

He envisions using sulfur waste to make lighter, cheaper electric car batteries capable of holding four to five times the charge we've come to expect. Because of its high refractive index and excellent mid-infrared transparency, sulfur also holds potential for optical applications, such as night vision devices, thermal monitoring sensors and medical imaging

hardware.

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