

CENTER FOR SUSTAINABLE MATERIALS SCIENCE (CSMS) develops proof-of-concept for new type of plastic that can be reduced back to molecules and used to create new plastic

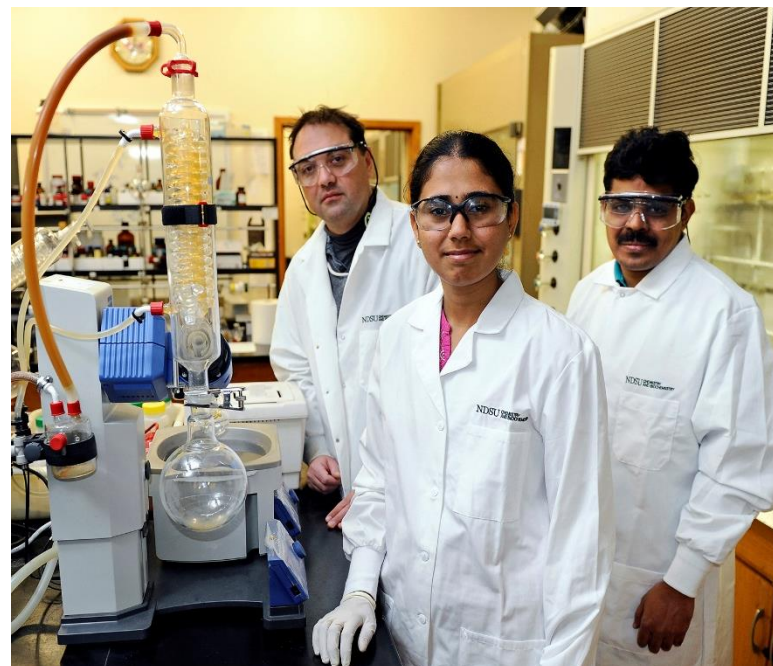
Outcome: A discovery by researchers at North Dakota State University, Fargo, holds scientific promise that could lead to a new type of plastic that can be broken down when exposed to a specific type of light and is reduced back to molecules, which could then be used to create new plastic.

Impact/Benefits: The research team focuses on biomass, using oilseed from agricultural crops, cellulose, lignin and sucrose to generate building blocks of molecules that are made into polymers to create plastics lessening dependency on fossil fuels. Their research has shown that they can break it down into the building blocks and re-make the polymer.

Explanation: In their proof of concept experiment, the group used fructose, found commonly in fruit, to create a solution of molecules, which was then converted to a plastic (polymer). By exposing the plastic to ultraviolet light at 350 nanometers for three hours, researchers degraded the plastic, reducing it back to the soluble building block molecules from which it began. Plastics usually don't decay for hundreds of years, creating solid waste issues. They generally degrade slowly, potentially leaching chemicals into the environment or creating toxins in the air when burned.

Dr. Mukund Sibi's lab makes monomers and biobased triggers; Dr. Sivaguru Jayaraman's group specializes in photochemical sciences and photo degradation; and Dr. Dean Webster's team works in polymer chemistry.

The researchers say further study is needed to evaluate the durability and strength of potential plastics derived from biomass before potential product commercialization could occur.



Published in the journal *Angewandte Chemie*, the proof of concept experiment outlines the work of researchers in the Center for Sustainable Materials Science at NDSU. The research team includes: L-R Angel Ugrinov, staff scientist in the Department of Chemistry and Biochemistry at NDSU, graduate student Ramya Raghunathan, and Reteesh Krishnan, postdoctoral fellow. The research group also includes Mukund Sibi, university distinguished professor and Sivaguru Jayaraman, a James A. Meier associate professor in the Department of Chemistry and Bioscience; postdoctoral fellow Saravana Rajendran; as well as Dean Webster, professor and chair of the Department of Coatings and Polymeric Materials and postdoctoral fellow Ivan Hevus.