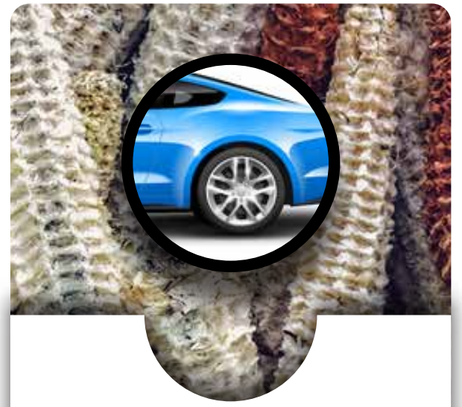
Bioproducts, Grown and Made in America

Through advances in scientific research and innovation, everyday products, materials, and chemicals can be produced from domestic, renewable resources like plants, algae, and wastes. These bioproducts offer an unprecedented opportunity to enhance U.S. economic competitiveness and bolster the "American-made" manufacturing industry. With funding from the U.S Department of Energy's Bioenergy Technologies Office, national laboratory science is setting the stage to enhance the American tradition of ingenuity and productivity.



"Driving" Innovation

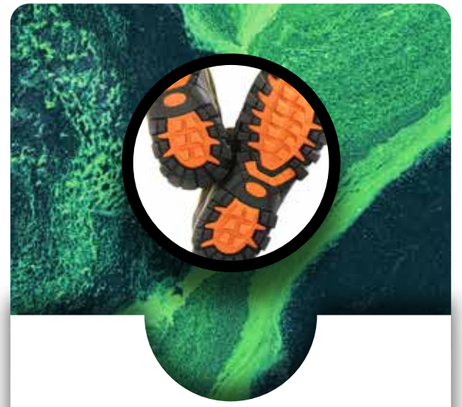
You may not know its name, but you likely use acrylonitrile every day. It's used in acrylic fibers for carpets, clothes, and fabrics, as well as in plastics like food containers and packaging materials. It is the primary building block for carbon fiber composites that are replacing heavier materials like steel in vehicles to lower costs and improve fuel efficiency. The National Renewable Energy Laboratory, in collaboration with Idaho National Laboratory and Oak Ridge National Laboratory, have developed a highly efficient, low-cost process to produce renewable acrylonitrile from biomass.

NREL · Oak Ridge National Laboratory · INL Idaho National Laboratory

Biomass in 3D

Through 3D printing, also known as additive manufacturing, we can make three-dimensional solid objects by laying down successive layers of material, forming the object layer by layer. This is great for producing highly complex shapes using less material than traditional manufacturing methods. Oak Ridge National Laboratory is now exploring opportunities to convert biomass, like poplar, into composites for 3D printing. These biobased feedstocks cost less, improve energy efficiency in manufacturing, promote rural and regional growth, and are easier to recycle.

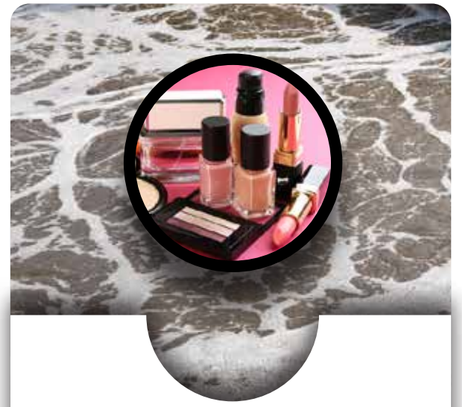
Oak Ridge National Laboratory



Putting the Building Blocks in Place

Scientists can convert biomass into a wide range of chemical building blocks used in everyday products. For example, butadiene is the building block for just about every major synthetic plastic or rubber. If America wore a pair of shoes, the soles would be made of this molecule. Pacific Northwest National Laboratory recently developed a process that converts bio-derived ethanol into butadiene. They are also working with Los Alamos National Laboratory, the Colorado School of Mines, Reliance Industries, and other partners to convert algae into building blocks used for industrial chemicals and polymers.

Pacific Northwest National Laboratory · Los Alamos National Laboratory



One Man's Trash...

Most of us have heard the old adage, "One man's trash is another man's treasure," and new technological innovations in the bioenergy industry are turning this into a reality. Argonne National Laboratory and the National Renewable Energy Laboratory have found a way to convert organic waste from dairies, breweries, and cities into organic acids. These organic acids are used as flavor enhancers in food and as ingredients in pharmaceuticals, cosmetics, and beverages. They're also used to produce biopolymers, coatings, adhesives, and other chemicals.

NREL · Argonne National Laboratory

Farming Bacteria for Plastics

You can't bake with this sugar, but for making bioproducts, it is very sweet. Cyanobacteria—photosynthetic microscopic bacteria found in lakes, streams, and oceans—harness energy from sunlight and turn it into chemical energy in the form of sugar. These sugars can be used to produce plastics, pharmaceuticals, fabrics, adhesives, shoe polish, and asphalt. HelioBioSys Inc., working with Sandia National Laboratories and Lawrence Berkeley National Laboratory, is exploring the feasibility of successfully farming cyanobacteria on a large scale.

Sandia National Laboratories · Berkeley Lab

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For more information about innovative public research, visit https://energy.gov/eere/bioenergy.

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