Biomass Program

Production of Polyhydroxyalkanoate Polymers

Polyhydroxyalkanoastes (PHAs) are naturally-occurring polymers produced by bacteria. They are produced within the bacterial cell and can be extracted and processed for use in many applications, including molded goods, paper coatings, non-woven fabrics, adhesives, films, and polymer performance additives. As a family of polymers, PHAs have functional properties sufficient to replace a significant portion of the 300 billion pounds of petroleum-based plastics used worldwide today.

This project is focused on developing processes for producing PHAs that can compete with conventional fossil-based polymers on both cost and performance. This includes developing improved technologies to extract and process PHAs and PHA blends. Researchers will also study the fundamental polymer properties of PHA polymers and their blends.

Another method of producing PHAs is genetically-modifying plants to produce PHAs. The U.S. Department of Agriculture is funding work on modifying switchgrass and this DOE project will also evaluate PHA extraction from switchgrass.

The first demonstration of film blowing with a PHA resin. Although there is much work still to be done to obtain a commercial process, this is a crucial first step.

R&D Pathway

Activities include: 1) studying alternative techniques for extracting PHAs from switchgrass and recovering PHAs from both switchgrass and *E. coli* fermentations; 2) designing integrated production and extraction facilities for use in biorefinery models; 3) investigating the fundamentals of PHA properties and processing; 4) reducing PHA fermentation costs; and 5) conducting life cycle assessments of PHA plastics. DOE will collaborate with PHA research funded by other Federal Agencies.

Bioproducts R&D

Benefits

- **Development of PHA polymers that compete economically with conventional fossil-based polymers**
- **Improved performance of other biobased polymers through blending with PHAs**

Applications

PHAs will find broad application in many product areas and in the future, contribute to the development of biorefineries.

Project Partners

Metabolix, Inc.
Cornell University
National Renewable Energy Laboratory
Oak Ridge National Laboratory
University of Akron
University of Bayreuth
University of Illinois
University of Massachusetts at Amherst
University of Massachusetts at Lowell

Project Period

FY 2002 – FY 2007

For more information contact:

Fred Gerdeman
DOE Golden Field Office
Fred.Gerdeman@go.doe.gov

EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov

Visit the Web site for the Office of the Biomass Program (OBP) at
www.eere.energy.gov/biomass/

June 2006