



Biomass Program

Sugars R&D

Enzyme-Mediated Pretreatment

This project will investigate the use of non-cellulase enzymes to break down lignocellulosic biomass in non-traditional process steps including application during biomass transportation, storage, and pretreatment, as well as novel separate hydrolysis and fermentation scenarios. The non-cellulase enzymes to be examined include hemicellulase and its accessory enzymes. The ultimate goal is biological pretreatment where enzymes deconstruct biomass with minimal or no thermochemical pretreatment.

R&D Pathway

The effect of non-cellulase enzymes on the cellulase digestibility of pretreated corn stover will be evaluated using standard enzyme digestion studies and simultaneous saccharification and fermentation studies. The goal is to develop process options effective in reducing

pretreatment severity, enzyme loading (cellulase and hemicellulase), or both. Economic models will also be developed.

Changes in the ultrastructure of pretreated biomass exposed to non-cellulase enzymes will be evaluated. Correlations between the new enzymes mixes, the resultant biomass ultrastructure, and cellulase digestibility, and between the severity of dilute acid pretreatment, surface ultrastructure, and hemicellulase use will be examined.

Economic models of various alternative biomass harvesting, transportation, storage, and pretreatment scenarios will be investigated, including the addition of hydrolases or hydrolase-secreting microbes during storage and transport, the regulated expression of degradative enzymes in plants, and the use of non-cellulase enzymes during pretreatment.

Benefits

- Increased understanding of enzymatic degradation of biomass
- Improved biomass pretreatment methods

Applications

This research will advance the goal of biological pretreatment and generate data on the mechanisms underlying changes in increased biomass susceptibility to enzymatic degradation.

Project Partners

National Renewable Energy Lab

Project Period

FY 2003 – FY 2005

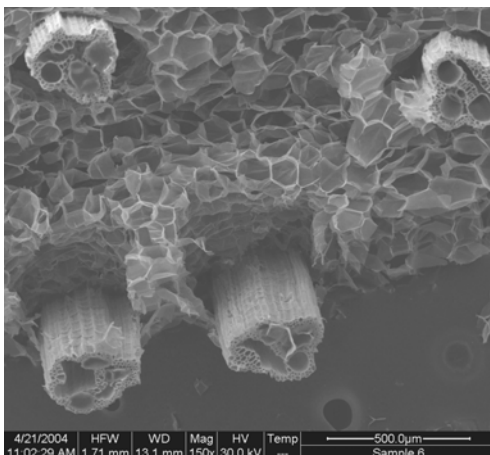
For more information contact:

Steve Decker
National Renewable Energy Lab
Steve_Decker@nrel.gov

EERE Information Center
1-877-EERE-INF (1-877-337-3463)

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

September 2004



Scanning electron micrograph of a cross section taken from Genencor Spezyme-treated corn stover stem. This enzyme preparation appears to initially target the space between the vascular bundles and the surrounding stem cells.