



Technical Support to SBIR Phase II Project: Improved Conversion of Cellulose Waste to Ethanol Using a Dual Bioreactor System

Cooperative Research and Development Final Report

CRADA Number: CRD-08-310

NREL Technical Contact: Min Zhang

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CRADA Title: Technical Support to SBIR Phase II project: Improved Conversion of Cellulose Waste to Ethanol Using a Dual Bioreactor System

Parties to the Agreement: Technova Corporation

Joint Work Statement Funding Table showing DOE commitment:

Estimated Costs	NREL Shared Resources
Year 1	\$ 00.00
Year 2	\$ 00.00
Year 3	\$ 00.00
TOTALS	\$ 00.00

Abstract of CRADA work:

Over-dependence on fossil fuel has spurred research on alternative energy. Inedible plant materials such as grass and corn stover represent abundant renewable natural resources that can be transformed into biofuel. Problems in enzymatic conversion of biomass to sugars include the use of incomplete synergistic enzymes, end-product inhibition, and adsorption and loss of enzymes necessitating their use in large quantities.

Technova Corporation will develop a defined consortium of natural microorganisms that will efficiently break down biomass to energy-rich soluble sugars, and convert them to cleaner-burning ethanol fuel. The project will also develop a novel biocatalytic hybrid reactor system dedicated to this bioprocess, which embodies recent advances in nanotechnology. NREL will participate to develop a continuous fermentation process.

Summary of Research Results:

1) Fermentation of Technov sugar streams

Six samples of AFEX-treated corn stover hydrolyzed with fungi mixed culture were provided by Technova. NREL conducted HPLC analysis to determine the sugar concentrations of these samples. Fermentation of three selected Technov sugar streams to ethanol was performed using *Zymomonas mobilis* 8b. The fermentation profiles for sugar feeds streams was obtained. As a control, fermentation of *Zymomonas mobilis* 8b in RM with 1.1% glucose and 1% xylose is conducted. All sugars are converted

with 24 hrs as expected. The glucose and xylose in all three sugar streams are converted to ethanol within 24 hours. These results showed that the sugar streams generated by AFEX-treated corn stover hydrolyzed with fungi mixed culture are easily fermentable and no toxicity was observed.

2) Prepared the xylose-fermenting strain *Zymomonas mobilis* 8b under MTA for providing Technova for immobilization.

3) Provided technical support and literature information to Technova for immobilization of *Zymomonas mobilis* 8b.

Subject Inventions listing: None

Report Date: Dec. 12, 2012 **Responsible Technical Contact at Alliance/NREL:** Min Zhang

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