National Center for Sustainable Transportation

Project Information Form

Project Title	Understanding and Advancing THF Co-solvent Enhanced Lignocellulosic Fractionation (CELF) Pretreatment when Integrated with Enzymatic Hydrolysis and Fermentation
University	UC Riverside
Principal Investigator	Dr. Charles E. Wyman (dissertation awardee: Abhishek Patri)
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Funding Source(s) and Amounts Provided (by each agency or organization)	
Total Project Cost	$20,000
Agency ID or Contract Number	
Start and End Dates	October 2016 – December 2017
Brief Description of Research Project	The development of an economically and energetically feasible pretreatment technology to convert a replenishable natural resource in lignocellulosic biomass to a sustainable transportation fuel is necessary. CELF pretreatment has been shown to yield very high sugar yields at economically-viable low enzyme loadings not possible with other pretreatments. Additionally, the glucan-rich solids from CELF can be integrated with subsequent processes such as simultaneous saccharification and fermentation (SSF) to enhance ethanol production performance. Thus far, we have been able to achieve sugar yields of 95% of theoretical maximum at a very economically viable enzyme loading of 2 mg protein/g glucan. These significant advantages in biomass pretreatment can be significantly augmented by realizing the proposed objective of converting extracted lignin from post-pretreatment liquid stream to high-value products. Although lignin's inherent recalcitrance and heterogeneity make it difficult to valorize, some native organisms have evolved metabolic pathways to utilize lignin-derived aromatic molecules as carbon sources. *Pseudomonas putida* has been demonstrated to be capable of converting *p*-coumarate, a model lignin-derived compound, into muconic acid for production of nylon and polyurethane with economically promising high yields and titers. CELF pretreatment produces a glucan-rich solid fraction for downstream hydrolysis and fermentation and a liquid stream containing extracted lignin that should be well suited for microbial conversion to value added products. Economically feasible conversion of extracted lignin following CELF pretreatment is essential to sustainable production of transportation fuels from plant biomass.

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Describe Implementation of Research Outcomes (or why not implemented) (Attach Any Photos)	
Impacts/Benefits of Implementation (actual, not anticipated)	
Web Links • Reports • Project website	https://ncst.ucdavis.edu/research/dissertation/