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Zhu Chen, Wesley D. Reznicek, Caixia Wan

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Deep Eutectic Solvent Pretreatment Enabling Full Utilization of Switchgrass

Zhu Chen, Wesley D. Reznicek, Caixia Wan*

Department of Bioengineering, University of Missouri, Columbia, Missouri 65211,

USA

* Corresponding author: Phone: +1 573 884 7882; Fax: +1 573 884 5650; E-mail:

wanca@missouri.edu

Abstract

In this study, an acidified, aqueous DES comprising choline chloride: glycerol (ChCl:Gly) was used to fractionate switchgrass into three major streams under a relatively mild condition: cellulose-rich pulp, lignin, and xylose-rich liquor. The pulp showed good digestibility with about 89% glucose yield. The solvent can be recycled successfully and reused for at least four more pretreatment cycles while maintaining its pretreatment capability. The solvent recycling also improved the lignin recovery from the pretreatment liquor. Lignin recovered from different pretreatment cycles had the β -O-4 bonds preserved, and shared similar structures with native lignin. Using the pretreatment liquor as a substrate, the oleaginous yeast *Rhodotorula toruloides* produced 18.7 g/L biomass with lipid and carotenoid titers of 8.1 g/L and 15.0 mg/L, respectively. Overall, this study demonstrated a green process integrating chemical and biological methods toward full utilization of lignocellulosic biomass.

Keywords: lignocellulosic biomass, enzymatic hydrolysis, pretreatment, deep eutectic solvent, lignin valorization, pretreatment liquor

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