

## Co-Production of Ethanol and Xylose from Woody Biomass

Shijie Liu <sup>1</sup>, Yang Wang <sup>1,2</sup>, Zheng Liu<sup>1</sup>, Jipeng Yan<sup>1,3</sup>, Yipeng Xie <sup>1</sup>, and Nirmal Joshee <sup>4</sup>

1. Department of Paper and Bioprocess Engineering, SUNY ESF, 1 Forestry Drive, Syracuse, NY 13210
2. Life Technologies, Thermo Fisher Scientific, Inc., Grand Island, NY
3. Lawrence Berkley National Laboratory, Emeryville, CA
4. Agricultural Research Station, Fort Valley State University, Fort Valley, GA 31030, USA

Woody biomass has becoming an attractive source of renewable energy and chemicals. While hot-water extraction of woodchips can be a beneficial technique to pretreat woody biomass, this presentation deals with the utilization of the extraction liquor. Hot water wood extract hydrolysate contains a mixture of sugars: xylose, glucose, galactose, mannose, arabinose and rhamnose. This sugar mixture presents a challenge in fermentation to ethanol and other chemicals / biofuel. The fermentation efficiency is especially low for xylose. When genetically modified *E. coli* fbr5 was employed to ferment the sugar mixture to ethanol, glucose was the first sugar consumed, and then galactose, arabinose, mannose and rhamnose, xylose was the last to be consumed. While *E. coli* fbr 5 was genetically engineered to ferment Xylose, this outcome is disappointing. Most microorganisms prefer glucose, *E. coli* is no exception. Xylose being the dominant sugar species in hardwood hot-water extract hydrolysate and the least preferred sugar for ethanol production present a challenge to the biomass energy industry development. On the other hand, xylose can be employed to produce xylitol, furfural, and a lot more products efficiently. The value of xylose is higher than glucose in the market, and yet it is limiting the efficiency in biomass conversion. Hot water wood extract hydrolysate was subject to fermentation with *S. cerevisiae* and xylose was left unconsumed. Xylose can be recovered from the fermentation broth, while ethanol was produced from glucose.