CEE 595AG Seminar
Environmental Engineering and Science Program Seminar

Combined Acid Hydrolysis of Hemicellulose in *Miscanthus* for Bioethanol Production

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Hemicellulose is the second most abundant component in the biomass, only after cellulose. Therefore, securing sugars from hemicellulose would significantly improve the process economics of biofuels. Recently, a biomimetic approach with dicarboxylic acids has emerged as a promising alternative for hemicellulose hydrolysis with inhibited sugar degradation, through mimicking the structure of cellulolytic enzyme catalytic domain. However, high cost of biomimetic catalysts is a major limiting factor for its commercial application. In this study, we adopt the concept of combined acid catalysis for asymmetric synthesis, and designed a combined acid system with sulfuric acid and two efficient biomimetic acids, trifluoroacetic acid (TFA) and maleic acid (MA), respectively. The strategy is to combine cost advantage of sulfuric acid and selectivity advantage of biomimetic catalysts. The influences of acid blending ratio, temperature, and acid dosage on pretreatment performance were investigated. A synergistic effect on hemicellulose decomposition was observed in the combined acid hydrolysis, which greatly increased xylose yield. Combined acid catalysts were found to facilitate decomposition of hemicellulose and oligomeric intermediates, and efficiently prevent xylose degradation as well. Fermentation tests of the acid-catalyzed hydrolysates showed that compared to sulfuric acid pretreatment, TFA and MA pretreatments improved overall ethanol yield with an increase by 27-54%. Combined acid catalysis was shown as a feasible pretreatment method for its improved sugar yield, reduced phenols production and catalyst costs.

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12:00 – 1:00 p.m.
2311 Newmark Yeh Center
Everyone is welcome
Refreshments will be available