

S71 / SRS-14 - Liquefaction of different Corn Stover fractions assisted by Enzyme-biomass deconstruction

Sunday, April 30, 2023 : 6:00 PM - 8:00 PM

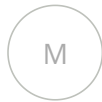
 Pavilion Ballroom (Plaza Level, Hilton Portland Downtown)

Sunday, April 30, 2023 : 5:43 PM - 5:44 PM

Abstract

Recalcitrant properties of different sources of lignocellulosic biomass represent challenges in materials processing within a biorefinery, as well as enzyme efficient deconstruction to fermentable sugars. Limitations include lignin derived enzyme inhibitors, enzyme inhibition by hydrolysis products, and resistance to mixing due to rheological properties of lignocellulosic particulates at high solids loadings. Consequently, we examined conditions that might be used to achieve liquid slurries (i.e., liquefaction) at solids loadings of 300 g/L before the material enters the biorefinery through a pretreatment step. This work explores enzyme-assisted liquefaction in a fed-batch process using the commercial enzymes Celluclast 1.5L or Ctec-2 at 1FPU/g or 3 FPU/g of dry solids, basis. Corn stover pellets were fed into a 1 L stirred bioreactor containing enzyme solution over a 5-hour period until reaching 30% solids loading (dry wgt / vol basis). After 6, 24 and 96 hours from the start of the run, samples were taken and characterized with respect to their sugar composition, rheology, water absorption and enzyme activity. Slurries with dramatically reduced yield stresses were achieved for corn stover. Yield stresses of 178 ± 7 Pa (3 FPU, Celluclast 1.5L) and 79 ± 6 Pa (3 FPU, Ctec-2) were measured for corn stover at 24 hours, compared to 6,000 Pa for samples without enzyme. Yield stress was 155 ± 29 Pa (3FPU, Ctec-2) and 257 ± 72 Pa (1 FPU, Celluclast 1.5L) for corn cobs at 24 hours. A profile based on 6, 24 and 96h of yield stress measurements and sugar conversion is presented. Enzyme activity is measured and the impact of liquefaction on an integrated processing in a biorefinery operation is discussed.

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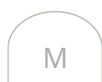
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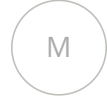
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