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**Rheology of corn stover slurries during fermentation to ethanol**

SANCHARI GHOSH, BRENDEN EPPS, LEE LYND, Thayer School of Engineering, Dartmouth College — In typical processes that convert cellulosic biomass into ethanol fuel, solubilization of the biomass is carried out by saccharolytic enzymes; however, these enzymes require an expensive pretreatment step to make the biomass accessible for solubilization (and subsequent fermentation). We have proposed a potentially-less-expensive approach using the bacterium *Clostridium thermocellum*, which can initiate fermentation without pretreatment. Moreover, we have proposed a cotreatment process, in which fermentation and mechanical milling occur alternately so as to achieve the highest ethanol yield for the least milling energy input. In order to inform the energetic requirements of cotreatment, we experimentally characterized the rheological properties of corn stover slurries at various stages of fermentation. Results show that a corn stover slurry is a yield stress fluid, with shear thinning behavior well described by a power law model. Viscosity decreases dramatically upon fermentation, controlling for variables such as solids concentration and particle size distribution. To the authors knowledge, this is the first study to characterize the changes in the physical properties of biomass during fermentation by a thermophilic bacterium.

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