Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Computational modeling of dilute biomass slurries MICHAEL SPRAGUE, JONATHAN STICKEL, National Renewable Energy Laboratory, PAUL FISCHER, Argonne National Laboratory, JAMES LISCHESKE, National Renewable Energy Laboratory — The biochemical conversion of lignocellulosic biomass to liquid transportation fuels involves a multitude of physical and chemical transformations that occur in several distinct processing steps (e.g., pretreatment, enzymatic hydrolysis, and fermentation). In this work we focus on development of a computational fluid dynamics model of a dilute biomass slurry, which is a highly viscous particle-laden fluid that can exhibit yield-stress behavior. Here, we model the biomass slurry as a generalized Newtonian fluid that accommodates biomass transport due to settling and biomass-concentration-dependent viscosity. Within a typical mixing vessel, viscosity can vary over several orders of magnitude. We solve the model with the Nek5000 spectral-finite-element solver in a simple vane mixer, and validate against experimental results. This work is directed towards our goal of a fully coupled computational model of fluid dynamics and reaction kinetics for the enzymatic hydrolysis of lignocellulosic biomass.

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Date submitted: 03 Aug 2012 Electronic form version 1.4