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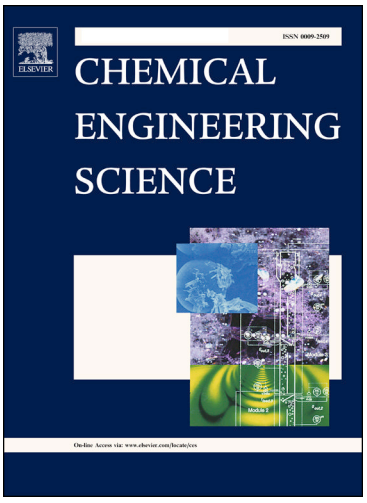

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Formulation and validation of a computational model for a dilute biomass slurry undergoing rotational mixing

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Abstract

In this paper we develop a computational model for the mixing and transport of a dilute biomass slurry. The objective was to create a sufficiently simple and efficient model for biomass transport that can be coupled with reaction models for the study of conversion of cellulosic biomass into fermentable sugars. Our target system is 5%-by-mass α-cellulose, which is our proxy for more complex lignocellulosic biomass. In the authors' previous work, an experimental investigation with α-cellulose under two vane-mixer configurations showed a bifurcation between a settling regime, for which settling effects dominate, and a suspended regime, for which solids are mostly suspended. Here, a mixed-fluid model was chosen, for which the model for the mixture-velocity field is the incompressible Navier-Stokes equations under the Boussinesq approximation for buoyancy. Solids transport includes

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