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Characterization of the black liquors pyrolysis by Computational Fluids Dynamics

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Abstract

In recent years, different types of biomass has been used as a sustainable alternative to produce energy for electricity and biofuel production. The interest in new applications is now shifted to the conversion of industrial residual biomass into new energy sources, in order to reduce the cost of bioenergy processes derived from the raw material, and also to minimize the generation of waste. One of the challenges in this area is the low heating value of the residual biomass, which requires the development of new thermal treatments.

We present here results concerning the simulation of a black liquors treatment process by Computational Fluid Dynamics (CFD). These results highlight the importance of the proper adjustment of the pyrolysis process in the output composition. Black Liquors pyrolysis is treated by considering the rate of devolatilization and the molar ratio of the compounds emitted. There are three ways of adjusting this rate: by a single rate equation, two single rate equation competing and by chemical percolation devolatilization. The kinetics of the devolatilization has been characterized for two types of black liquors (one proceeding from a Kraft process and the other one from the Sosa process) through thermogravimetric analysis. We will also present results regarding the determination of the kinetic constants and the order of the reactions evaluating the influence of three main parameters: the heating rate, the temperature and the residence time (up to 200 min).

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