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Effect of particle devolatilization on bed dynamics during biomass thermochemical conversion PERRINE PEPIOT, JESSE CAPECELATRO, OLIVIER DESJARDINS, Cornell University — Fluidization is a technique of choice for the thermochemical conversion of biomass. At conversion temperatures however, the amount of gases released by the biomass is large enough to impact the mixing of the reactive particles with the inert sand, and modify the bubbling frequency and intensity. This, in turn, may significantly affect the chemical processes and the final product distribution. In this context, optimizing reactor design and operating conditions requires a better understanding of the actual bed dynamics in the presence of reactive particles. In this work, two- and three-dimensional simulations of biomass conversion in a lab-scale fluidized bed reactor are conducted using a Lagrangian approach to handle the solid phase. The biomass devolatilization chemistry is described using a commonly used global model taking into account each constituent of the biomass. Statistical analysis of the particles and velocity fields is conducted and results are compared to non-reactive cases to quantify the effect of devolatilization on particle mixing, especially segregation, and on the bubbling pattern of the bed.

Perrine Pepiot
Cornell University

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