Modeling the influence of potassium content and heating rate on biomass pyrolysis

This study presents a combined kinetic and particle model that describes the effect of potassium and heating rate during the fast pyrolysis of woody and herbaceous biomass. The model calculates the mass loss rate, over a wide range of operating conditions relevant to suspension firing. The shrinking particle model considers internal and external heat transfer limitations and incorporates catalytic effects of potassium on the product yields. Modeling parameters were tuned with experimentally determined char yields at high heating rates (>200 K s⁻¹) using a wire mesh reactor, a single particle burner, and a drop tube reactor. The experimental data demonstrated that heating rate and potassium content have significant effects on the char yield. The importance of shrinkage on the devolatilization time becomes greater with increasing particle size, but showed little influence on the char yields.

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