

The effect of components interaction in biomass during two-stage pyrolysis

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The three primary biomass components (lignin, cellulose and hemicellulose), lignocellulosic biomass (pine sawdust and sunflower husk) and model mixtures (prepared by mixing the three primary components) were pyrolysed in a thermogravimetric analyzer and a two-stage reactor. In TGA, char yield of cellulose was smaller than that of hemicellulose and lignin. Cellulose showed the narrow temperature range (310-390 °C) of devolatilization with the maximum weight loss rate at 355 °C. Hemicellulose began to degrade earlier than the other components at about 160 °C, devolatilization mainly occurred in the range of 200-300 °C. Lignin started to decompose at 200 °C and continued until about 700 °C. The maximum of weight loss rate of lignin and cellulose coincided in the range of 300–400 °C. The three components showed different temperature intervals of intense synthesis gas formation. The synthesis gas obtained from the model sawdust mixture was close in composition and yield to the calculated values obtained based on the characteristics of the synthesis gas from the components. The composition and the yield of synthesis gas obtained from sunflower husk and model mixture were similar. The predicted values of the syngas yield, calculated through the mass fractions of the components, were higher than those obtained experimentally. The curves profiles of synthesis gas yield from the sunflower and the model mixture repeated each other, but the curve of the model mixture was shifted towards higher temperatures. This reported study was funded by RFBR, project No. 20-08-00835A.