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The Role of Surface Area in Catalytic Gasification of Biomass

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ABSTRACT

Gasification of biomass has the potential to provide a carbon-negative source of liquid fuels. The current limited use of gasification is due in part to the high temperatures necessary to achieve high conversion levels. These temperatures can be lowered by the use of catalysts, but the mechanisms by which catalysts affect the reaction rate are not fully understood. Here, the structural component of potassium carbonate's role in the gasification process was examined. Samples of pinewood sawdust were impregnated with potassium carbonate, then pyrolyzed with N_2 in a fixed bed reactor at 750°C (heater thermocouple reading). Half of the char was washed with deionized water twice to remove potassium ions. The char was ground to a 150 micron diameter. Gasification of the samples was performed using CO_2 at 750°C and 900°C. Reaction rates over time were compared to the reaction rate of pure pinewood sawdust char. The pure char was then impregnated with K_2CO_3 and gasified, allowing a comparison to be made between the efficacy of impregnating the sawdust versus the char. Results show that after washing, the impregnated char shows similar or decreased reactivity compared to the pure char. Preliminary results do suggest that impregnation of the sawdust leads to greater reactivity over time than impregnation of the char. The results do not suggest a strong influence of surface area change during impregnation on the reactivity of the char.

KEYWORDS

Biomass, catalytic gasification, impregnation, CO_2 recycling, renewable energy