

Gasification of Trans-4-Hydroxycinnamic Acid with Ethanol at Elevated Temperatures

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Abstract : Lignin is a major constituent of woody biomass, and exists abundantly in nature. It is the major byproducts from the paper industry and bioethanol production processes. The byproducts are mainly used for low-valued applications. Instead, lignin can be converted into higher-valued gaseous fuel, thereby helping to curtail the ever-growing price of oil and to slow down the trend of global warming. Although biochemical treatment is capable of converting cellulose into liquid ethanol fuel, it cannot be applied to the conversion of lignin. Alternatively, it is possible to convert lignin into gaseous fuel thermochemically. In the present work, trans-4-hydroxycinnamic acid, a model compound for lignin, which closely resembles the basic building blocks of lignin, is gasified in an autoclave with ethanol at elevated temperatures and pressures, that are above the critical point of ethanol. Ethanol, instead of water, is chosen, because ethanol dissolves trans-4-hydroxycinnamic acid easily and helps to convert it into lighter gaseous species relatively well. The major operating parameters for the gasification reaction include temperature (673-873 K), reaction pressure (5-25 MPa) and feed concentration (0.05-0.3 M). Generally, more than 80% of the reactant, including trans-4-hydroxycinnamic acid and ethanol, were converted into gaseous products at an operating condition of 873 K and 5 MPa.

Keywords : ethanol, gasification, lignin, supercritical

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