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Influence of reaction conditions on the composition of liquid products from two-stage catalytic hydrothermal processing of lignin

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Abstract

The influence of reaction conditions on the composition of liquid products during two-stage hydrothermal conversion of alkali lignin has been investigated in a batch reactor. Reactions were carried out in the presence of formic acid (FA) and Pt/Al₂O₃ catalyst. The two different sets of reaction conditions involved alternative reaction times of 1 h and 5 h at 265 °C and 350 °C respectively. These provided different contributions to reaction severity, which affected the compositions of liquid products. Yields of liquid products reached up to 40 wt% (on lignin feed basis) in the presence of FA under the less severe reaction condition. With 5 h reaction time at 350 °C, alkylphenols, alkylguaiacols and hydrocarbons were the dominant liquid products. However, with 5 h reaction time at 265 °C, phenol and methanol became dominant. The two-stage hydrothermal process led to improved lignin conversion, with the potential to manipulate the liquid product range.

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