

Journal of Wood Chemistry and Technology

Heterogeneous acid-catalyzed biodiesel production from crude tall oil: a low-grade and less expensive feedstock

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Abstract

The present study indicates that solid acid catalysis of crude tall oil (CTO) over a WO₃/ZrO₂ catalyst is effective in converting the CTO fatty acids components into biodiesel in high yield. Preparation of the catalyst by an impregnation method was selected and WO₃ activity was best at a loading mass fraction of 5% to ZrO₂ support and activation at 500 C for five hours under air at atmospheric pressure. Optimal reaction conditions were reaction temperature at 250 C; methanol to CTO molar ratio at 10; reaction time four hours, catalyst mass fraction of 3%; and stirring intensity at 625 rpm. The conversion at optimal reaction conditions was 70%. The catalyst was highly active at temperatures higher than 200 C. The biodiesel produced met some, but not all, the diesel quality parameters stipulated by standard specifications such as ASTM D6751 and EN14214.