



Cyprus
University of
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Faculty of Chemical
Engineering

Bachelor's Thesis

**Process Simulation Modelling of the Catalytic
Hydrodeoxygenation of 4-Propylguaiacol in Microreactors**

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Limassol, May 2023

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ABSTRACT

The utilization of fossil fuels as the main energy source has resulted in significant greenhouse gas emissions. To address the environmental impact of fossil fuels, the significance of alternative fuels such as biomass has grown substantially. Bio oil is a liquid fuel derived from biomass through pyrolysis. It has potential as a renewable energy source and can be used as a substitute for conventional fossil fuels. However, further research is needed to enhance its properties and make it more commercially viable. The current study examines the hydrodeoxygenation of 4-propylguaiacol, a lignin derived compound that is present in bio-oil. The reaction is investigated using process simulation modelling via Aspen Plus. A packed bed microreactor was used over a NiMo/Al₂O₃ catalyst. Properties such as temperature, pressure, liquid flow rate and residence time were investigated and compared with experimental results from literature to examine the effect of them on production of 4-propylphenol. Results showed good agreement of the model with the experimental data.

Keywords: Biomass, pyrolysis, bio-oil, hydrodeoxygenation, microreactors, process simulation modelling