



Cyprus
University of
Technology

Faculty of Geotechnical
Sciences and
Environmental
Management

Bachelor's Thesis

**CFD modelling of packed bed microreactor for hydrogen
production through decomposition of formic acid using a
Pd/C catalyst**

Anastasia Spanou

Limassol, May 2022

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The approval of the thesis by the Department of Chemical Engineering does not imply necessarily the approval by the Department of the views of the writer.

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ABSTRACT

As our environment is facing a major threat because of the ever-increasing global warming and its consequences, it is clear that we must take action. Research on finding an alternative for fossil fuels is proving that hydrogen can be a viable and sustainable alternative. The purpose of this work is to design and study a packed bed microreactor for hydrogen production through decomposition of formic acid using a Pd/C catalyst. The microreactor was theoretically simulated by designing a 2D computational fluid dynamic (CFD) heterogeneous microreactor model. In this study the aim was to understand how different design parameters affect the efficiency of the packed bed microreactor by studying their effect on formic acid's conversion. With CFD modelling, parameters such as inlet concentration, flowrate, temperature, bed and catalyst porosity and the reactors dimensions were altered. From the results a clear view on how to maximize the conversion for hydrogen production was offered and the effect of mass transfer resistances was also found to be negligible.

Keywords: Hydrogen production, formic acid, packed bed, microreactors, heterogeneous catalysis, Pd/C catalyst, CFD