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PII: S0960-8524(17)32211-3
DOI: https://doi.org/10.1016/j.biortech.2017.12.067
Reference: BITE 19322

To appear in: *Bioresource Technology*

Received Date: 8 November 2017
Revised Date: 19 December 2017
Accepted Date: 20 December 2017

Please cite this article as: Shakya, R., Adhikari, S., Mahadevan, R., Hassan, E.B., Dempster, T.A., Catalytic Upgrading of Bio-oil Produced from Hydrothermal Liquefaction of *Nannochloropsis* sp, *Bioresource Technology* (2017), doi: https://doi.org/10.1016/j.biortech.2017.12.067

Catalytic Upgrading of Bio-oil Produced from Hydrothermal Liquefaction of *Nannochloropsis* sp.

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Abstract

Upgrading of bio-oil obtained from hydrothermal liquefaction (HTL) of algae is necessary for it to be used as a fuel. In this study, bio-oil obtained from HTL of *Nannochloropsis* sp. was upgraded using five different catalysts (Ni/C, ZSM-5, Ni/ZSM-5, Ru/C and Pt/C) at 300^{o}C and 350^{o}C. The upgraded bio-oil yields were higher at 300^{o}C; however, higher quality upgraded bio-oils were obtained at 350^{o}C. Ni/C gave the maximum upgraded bio-oil yield (61 wt.%) at 350^{o}C. However, noble metal catalysts (Ru/C and Pt/C) gave the better upgraded bio-oils in terms of acidity, heating values, and nitrogen values. The higher heating value of the upgraded bio-oils ranged from 40 to 44 MJ/kg, and the nitrogen content decreased from 5.37 to 1.29 wt.%. Most of the upgraded bio-oils (35-40 wt.%) were in the diesel range. The major components present in the gaseous products were CH_4, CO, CO_2 and lower alkanes.

Keywords: *Algae; Hydrothermal liquefaction; Bio-oil; Catalytic upgrading; Hydrodenitrogenation.*

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