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**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°C and 350°C. The upgraded bio-oil yields were higher at 300°C; however, higher quality upgraded bio-oils were obtained at 350°C. Ni/C gave the maximum upgraded bio-oil yield (61 wt.% ) at 350°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<sub>4</sub>, CO, CO<sub>2</sub> and lower alkanes.

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

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