Production of high quality bio-oil from hydrothermal liquefaction of *Nannochloropsis sp.* in mild condition

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Hydrothermal liquefaction (HTL) in a subcritical water (175-375 ℃, 5-22 MPa) was developed to produce energy intensive 'bio-crude' oil from Nannochloropsis. sp. In spite of diverse research on HTL of microalgae, high content of heteroatom mainly nitrogen (4-6%) and sulfur(＜2%) still remains as problem. In this research, we used Nannochloropsis sp. (11.2% saponifiable lipid, 20% total lipid) to convert under HTL conditions (200-300℃, 12-89 bar, and 90 min reaction time). Energy dense bio-crude whose higher heating value(HHV) and effective hydrogen-to-carbon (H/Ceff) vary from 38.15-39.03 MJ/kg and 1.37-1.59 was produced. Despite bio-crude yield reached the highest at the 300℃, it shows lowest quality due to high heteroatom content, and existence of polyaromatic ring compounds. On the other hand, high quality of bio-crude under 200℃ was produced with 10.5% of yield which indicates simply extraction of saponifiable lipids. Considering environmental issue and follow-up process (catalytic conversion), usage of microalgae which contains high saponifiable lipid under mild condition HTL is feasible for industrial scale.