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# Effect of Acidic, Neutral and Alkaline Conditions on Product Distribution and Biocrude Oil Chemistry from Hydrothermal Liquefaction of Microalgae

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## Abstract

Hydrothermal liquefaction (HTL) of microalgae produces high amount of water-insoluble organic compounds, the biocrude oil. Using high-growth-rate *Spirulina platensis* as feedstock, product fraction distribution and biocrude oil chemistry from HTL at a temperature of 240-300 °C under acidic, neutral and alkaline condition were studied. Positive effects on biocrude oil yield were only found with KOH and acetic acid, and these effects were stronger under milder HTL conditions. FT-ICR MS showed that O<sub>2</sub> class in the biocrude was high due to higher carbohydrate in the biomass, numbers of N<sub>3</sub>O<sub>5-6</sub> species present in the sample from acetic acid run, indicating its less decarboxylation ability. GC-MS showed more ketones and amides were formed from fatty acids in catalytic HTL, and this effect was sensitive toward reaction temperature. GPC suggested more light volatiles were in biocrude from KOH run, while analysis from NMR, FT-IR and elemental confirmed its high oil quality.

**Key words:** Biofuel; Hydrothermal liquefaction; KOH; Acetic acid; Microalgae;

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