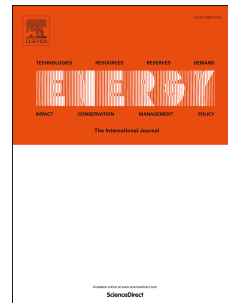


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# Integration of hydrothermal liquefaction and supercritical water gasification for improvement of energy recovery from algal biomass

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## Abstract

Herein, we report on a combined process that incorporates hydrothermal liquefaction (HTL) and supercritical water gasification (SCWG) to improve energy recovered from algal biomass. Eight algal biomasses, including four microalgae and four macroalgae with a large difference in biochemical compositions, were screened for this dual process. The algal biomass feedstocks significantly affected the carbon and energy distribution in the product fractions (crude bio-oil, solid, gas, and water-soluble products). 62.50-71.34% energy of microalgae and 6.03-41.06% energy of macroalgae could be recovered as crude bio-oil. 11.86-21.55% carbon of the microalgae and 8.01-15.82% carbon of the macroalgae was distributed in the HTL process water in form of water soluble products after the HTL process. 14.3-33.7% energy of microalgae and 30.18-36.34% energy of macroalgae was retained in the HTL process water. SCWG could convert the organics in the HTL process water into fuel gases consisting mainly of H<sub>2</sub> and CH<sub>4</sub>. 54-91% carbon of the HTL process water was transformed into the fuel gases, which correspond 5.53-18.30% energy of the algal biomass. Thus, this work shows that the integration of HTL and SCWG could improve energy recovery from algal biomass relative to the HTL process alone.

**Keywords:** Algae; integration; hydrothermal liquefaction; supercritical water gasification; energy recovery

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