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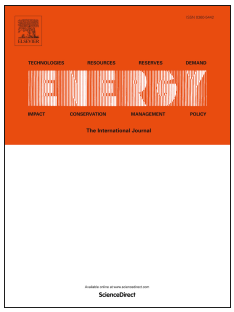

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PII: S0360-5442(18)30864-8

DOI: 10.1016/j.energy.2018.05.044

Reference: EGY 12877

To appear in: *Energy*

Received Date: 21 February 2018

Revised Date: 4 May 2018

Accepted Date: 6 May 2018

Please cite this article as: Duan P-G, Yang S-K, Xu Y-P, Wang F, Zhao D, Weng Y-J, Shi X-L, Integration of hydrothermal liquefaction and supercritical water gasification for improvement of energy recovery from algal biomass, *Energy* (2018), doi: 10.1016/j.energy.2018.05.044.

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

Pei-Gao Duan, Shi-Kun Yang, Yu-Ping Xu*, Feng Wang, Dan Zhao, Yu-Jing Weng, Xian-Lei Shi*

College of Chemistry and Chemical Engineering, Department of Energy and Chemical Engineering, Henan Polytechnic University, No. 2001, Century Avenue, Jiaozuo, Henan 454003, P.R. China

## 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 $H_2$ and $CH_4$. 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

*Corresponding author. Tel.: +86(0391) 3986820; fax: +86(0391) 3987811; Email address: xuyuping@hpu.edu.cn (X-Y. Xu);shixl@hpu.edu.cn(X-L Shi)