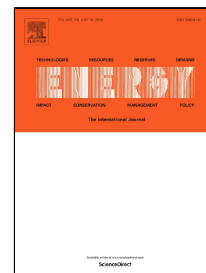


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Comprehensive evaluation on product characteristics of fast hydrothermal liquefaction of sewage sludge at different temperatures

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1 **Comprehensive evaluation on product characteristics of fast**
2 **hydrothermal liquefaction of sewage sludge at different temperatures**

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7
8 **Abstract:** Hydrothermal liquefaction (HTL) can chemically convert sewage sludge (SS) into a
9 crude bio-oil (biocrude) and other by-products. This work systematically elucidates how the yields
10 and compositions of different products (e.g., gases, biocrude and solids) vary with temperature
11 (260–350 °C) in SS HTL with 10 min of residence time. The results show that increasing
12 temperature improved the biocrude quality and the gas yield, declined the water-soluble substance
13 yield, the solid yield, and the TOC (total organic carbon) content in aqueous phase, while the
14 biocrude yield and the NH₃-N (ammonia nitrogen) content in the aqueous phase first raised and
15 then decreased, and reached the maximum values at 340 °C. After SS HTL at 340 °C, light
16 biocrude, light solids, water-soluble organic matters accounted for about 54.4, 50.5, 88.9 wt.% of
17 total biocrude, solids and water-soluble substances, respectively. The N and S contents in the light
18 biocrude almost halved compared with those in the heavy biocrude. The light solids contained a
19 higher C content but lower Al, Si, Ca and Fe contents than did the heavy solids. >93.0 wt.% of Cu,
20 Zn and Cr remained in the solids in contrast to 0.5–1.0 wt.% in the aqueous phase and 0.2–4.7
21 wt.% in the biocrude.

22 **Keywords:** hydrothermal liquefaction; sewage sludge; biocrude; heavy metal; water-soluble
23 substance

24
25 **1. Introduction**

26 Sewage sludge (SS), generated from the disposal processes of domestic wastewater, consists of

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