

HYDROTHERMAL LIQUEFACTION OF AN INDUSTRIAL BIOMASS WASTE: BREWER'S SPENT GRAIN (BSG)

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ABSTRACT

This research examines the use of hydrothermal liquefaction (HTL) process for a treatment of biomass industrial waste. Brewer's spent grain (BSG) is a source of lignocellulose that has a potential to be used for chemicals and fuels production, thereby reducing the reliance on fossil sources. There are relatively few investigations on using BSG in this system; hence, the development of new techniques to valorise this agro-industrial waste is of a great interest as BSG is available in large quantities throughout the year. Two modes of HTL have been investigated to determine the effects of using the BSG with high moisture content. The first mode used the BSG as received without pre-treatment while the second mode used the dried BSG mixed with pure water. The BSG conversion, water-soluble oil (WSO) yield and liquid product generation were measured for both modes. The liquid products were also analysed to determine the types and concentration of valuable products obtained via HTL. The characterisation of the BSG reveals that the moisture content of the BSG is 74.7wt.% while the FTIR spectra confirms the presence of cellulose, hemicellulose and lignin in the BSG. In addition, the comparison between the two HTL modes indicates that the direct HTL gives better BSG conversion, higher WSO yield and higher valuable products concentration. Therefore, it is concluded that BSG has a high potential to be converted into valuable products via direct HTL without pre-treatment. This opens a new opportunity for a sustainable alternative to waste valorization.

Keyword: hydrothermal liquefaction (HTL), Brewer's spent grain (BSG), water-soluble oil (WSO), cellulose