

Production of biofuel from macroalgae via supercritical water extraction

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Abstract

Among the various types of biomass, macroalgae have the potential of becoming a significant energy source for biofuel production in the coming years. Currently, research is mainly focusing on optimization of the cultivation in the shallow seawater. Due to their high mass fraction of water (80-90%), traditional thermochemical processes like pyrolysis and gasification are economically not very interesting. Thermochemical processes for wet biomass, such as supercritical water, hydrothermal liquefaction or hydrothermal carbonization appear to be more suitable for macroalgae feedstock. Supercritical water is an approach that requires no drying because the whole macroalgae biomass is decomposed and converted in hot compressed water. A bio-crude oil is obtained as the main product, next to gaseous, aqueous and solid by-products.

This work investigated the extraction of bio-oil from macroalgae using supercritical water. Effects of process parameters such as extraction pressure, temperature and residence time were investigated. The yield of bio-oil increased with increase in pressure, temperature. However, under different operating conditions, the composition of bio-oil varied. The study of physical properties and chemical composition of the bio-oil obtained through supercritical water extraction showed better quality as compared to the bio-oil obtained through pyrolysis.

Keywords:

Macroalgae; Supercritical water; Biofuel production; Biomass conversion; Thermochemical.