

Optimized conditions of supercritical ethanol for algal biomass liquefaction

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Algal biomass is one of the most promising alternative sources of sustainable energy because of its increased CO₂ absorption and rapid growth which leads to reduction in global warming. In addition to that, it does not have to compete with food crops for its production as it grows naturally in sea because of appropriate environment for its growth. In this study, effect of reaction conditions like temperature, residence time and biomass to solvent ratio on liquefaction yield of macroalgae is observed using supercritical ethanol as a solvent. This study shows that all three parameters are equally important to increase the yield of bio-oil and to improve properties like molecular weight, carbon and oxygen contents of the final product. We claim to have highest yield of bio-oil of up to 78 % on dry ash free basis from macroalgae feedstock at temperature 400 °C, time 45 min and biomass/solvent ratio of 1:9.4 in the absence of catalyst. For this optimum value of yield, oxygen contents in the bio-oil were decreased to about 12 % and average molecular weight of bio-oil sample was 398 g/mol. At these conditions, there is a sudden improvement of properties like higher heating value(HHV = 36.6 MJ/kg), carbon and hydrogen recovery(CHR = 139.4 %), energy recovery(ER = 194.8 %) and energy efficiency(EE = 115.7 %).