

Thermochemical conversion of microalgal biomass for biofuel production

ABSTRACT

Reliable and sustainable energy supply is critical to effective natural resource management, and it encompasses functioning efficiency of energy resources as well as socio-economic and environmental impact considerations. The complete reliance on fossil fuels is recognized as unsustainable throughout the world, and this is due to, amongst others, the rapid declining of fossil fuel reserves and the emission of significant quantities of greenhouse gases associated with their production and combustion. This has resulted in escalating interest in research activities aiming to develop alternative and somewhat carbon neutral energy sources. Algal biofuels, so called third generation biofuels, appear to be promising in delivering sustainable and complementary energy platforms essential to formulate a major component of the renewable and sustainable energy mix for the future. Algal biomass can be converted into various portfolios of biofuel products, such as bio-hydrogen, biodiesel, bioethanol and biogas, via two different pathways: biochemical and thermochemical pathways. Thermochemical conversion is considered as a viable method to overcome the existing problems related with biochemical conversion such as lengthy reaction time, low conversion efficiency by microbes and enzymes, and high production costs. This paper discusses process technologies for microalgae-to-biofuel production systems, focusing on thermochemical conversion technologies such as gasification, pyrolysis, and liquefaction. The benefits of exploiting upstream microalgal biomass development for bioremediation such as carbon dioxide mitigation and wastewater treatment are also discussed.

Keyword: Microalgae; Thermochemical; Gasification; Pyrolysis; Liquefaction; Bioremediation