

Process design and simulation of sustainable bio-fuel production from brown seaweeds via thermochemical route

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Biofuels are generally regarded as a valid replacement for crude oil derivatives, as they have the potential to provide environmental sustainability, carbon neutrality, and energy security through diversification of supply. In this work, industrial-scale bio-fuel production was designed and simulated using Aspen Plus process simulation software. Experimental data for bench scale indirectly heated pyrolysis of brown alga *Saccharina japonica* was used. Process design includes pretreatment of the “as is” seaweed feedstock, pyrolysis conversion, heat and power production via solid bio-char combustion and downstream processing of the liquid pyrolysis oils through quench phase separation and hydrotreatment. In this stage, the research provides a strong insight into a complete industrial process of bio-fuel production via pyrolysis, including mass and energy balances, as well as an initial economic assessment. Subsequent research will present viable process alternatives, different market scenarios and integration with a biochemical conversion platform.