

Optimization of the ionic liquid-microwave assisted one-step biodiesel production process from wet microalgal biomass.

ABSTRACT

This study illustrates the influence of ionic liquid (IL)-microwave heating on the direct transesterification (in-situ transesterification) of wet *Nannochloropsis* sp. biomass to biodiesel. The ionic liquid used was 1-ethyl-3-methylimidazolium methyl sulphate [EMIM][MeSO₄]. Direct transesterification process variables such as the wet algae to methanol ratio, reaction time and methanol to IL ratio influencing the biodiesel production were optimised using response surface methodology (RSM). The results revealed that the maximum biodiesel yield(40.9%) was achieved when the ratio of wet algae to methanol (wt/vol) was kept at 1:4, methanol :IL ratio maintained at 1:0.5 at reaction time of 25 min. The FAMES composition depicted a high content of unsaturated FAMES suitable for biodiesel production. The synergetic effect of combining IL-methanol solvent and microwave heating at optimised reaction conditions enabled the production of an incredibly high biodiesel yield per dry biomass of 42.22%.