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論 文 要 旨

THESIS SUMMARY

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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

Algae-based biofuels, also known as the 3rd generation biofuels, are believed to be a displacement of transportation fossil fuels in the near future. The alternative biofuels have been increasing public's attention regarding rising world's population, declining fossil fuels and worsening global environment. Algae are becoming increasing interesting as a numerous of advantages including the fastest growing species, improve carbon dioxide mitigation, no competition with agricultural land, water and food, and high lipid content species. A constrain has been concerning is economical issue comparing to fossil-derived fuels. Current technologies for wet biomass extraction, cultivation cost and downstream functioning are challenging still. A number of researchers have proven these are realistic and implemented on a commercial scale. However, there are some points lack of subjected. This study, thereafter, would like to introduce the proven technologies have been advised for decades to cope with microalgae-based biofuels' by-products in a practical way aims to economize the algae-based biofuels production.

The hydrothermal treatment (HTT), an effective technology for extraction liquid biofuel from wet biomass, was first employed on freshwater green microalgae TISTR-8511 strain (Chlorellaceae strain) to extract bio-oil. The 2 key parameters, operating temperature (190-250^{o}C) and retention time (30, 60 and 90 min), were applied over the HTT mechanism in order to observe their best relevance. Then 4 main products were obtained; bio-oil, gaseous, solid and aqueous co-products. The results revealed that the condition at 230^{o}C and 60 min retention time gave the best bio-oil yield of 3.54% and followed by the yield of 3.39% at 230^{o}C and 30 min retention time and 3.27% at 250^{o}C and 30 min retention time. The bio-oil was then analyzed for a feasibility to be upgraded to biodiesel and it showed a comparable for upgrading. The solid co-product, on the contrary, served the best yield with the lowest bio-oil yield. Nevertheless, the solid co-products were further analyzed for available nutrients and only the products employed by 60 min retention time were implemented on Komatsuna (Brassica rapa var. perviridis) planting at 3 applying ratios; 100%, 50% and 25%. Only the solid co-products of 60 min retention time were practiced as of the best bio-oil yield. The practical planting showed that nitrogen nutrient is the most essential factor for plant growth. Moreover, an organic fertilizer provides better yield than an inorganic fertilizer. Additionally, the highest dry weights were also observed at 230^{o}C on all applying ratios. However, most of the yields were lower than the standard fertilizer excluded when 100% applying ratio was applied on 190-230^{o}C. The aqueous co-products were next recovery as of a rich nutrient product. They were first analyzed for available nutrients required for algae growth. Next, they were diluted to 2%v/v with distilled water and implemented to the marine water green microalgae, Chlorella sp. The results showed the highest protein content was found at 5.75%wt when 250^{o}C and 60 min retention time was employed. Furthermore, they revealed

that the yield of protein content behaved similar to the available organic nitrogen in the algae medium. In addition, the yield of carbohydrate content also revealed the similar performance with the available inorganic carbon in the algae medium where the highest yield was found at 4.89%wt when 190^{o}C and 60 min retention time was employed. Unlike the lipid content, the highest yield was observed at 230^{o}C and 90 min retention time of 2.06%wt with no correlation to any element. Nonetheless, most of these contents were produced at lower yield than when the Rodik standard algae medium was applied, unless the protein content.

The study can be concluded that the economical viability of microalgae-based biofuels production employing low temperature HTT (190-250^{o}C and 30-90 min retention time) is realistic with the implementation of co-products for solid bio-fertilizer and algae growth media.