Parametric Study of Biodiesel Production from Waste Oil

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ABSTRACT

Since the industrial revolution, the CO2 emission to the atmosphere has kept increasing year by year. The average CO2 emission per person in Taiwan is three times as much as the global average. Because biomass raw materials are produced by absorbing CO2 from the atmosphere, and the carbon cycle requires only a period from 1 to 10 years, compared to a period of millions of years for petroleum, the impact on the environment can be remarkably reduced. In this research, waste oil is used to produce biodiesel, and the results are compared against the products from the soy bean oil. It is hoped that the nature of the research fits not only the requirement of environmental protection, but also the usage of renewal energy. This thesis is aimed to explore the effects of temperature, and different catalysts (NaOH and KOH) on the production rate and the yielding quality of the biodiesel in the transesterification process using either waste oil or soy bean oil. According to experimental results, the optimal parameters for the production of biodiesel from waste oil are suggested as below. With the same catalyst, the reaction time of 120 minutes is suggested. The yield rate is79.29% which is 17.79% higher than that for 30-minute reaction time. The MEOH/oil ratio of 6:1 is suggested. Its yield rate is85.24% and is 7.23% higher than molar ratio of 3:1. A stirring speed of 900rpm is suggested which gives a yield rate of 85.23%, and is 6.43% higher that that for 300rpm. The reaction temperature is suggested to be 60°C. When the NaOH to oil ration is fixed at 0.5 wt.%and the temperature increases from 30°C to 60°C,the yield increases 12.11%, resulting a yield of 78.34%. By using KOH at similar conditions, it can enhance 20.84%, resulting a yield of 85.39%. In view of catalyst consumption, increasing KOH from 0.1 wt.% to 1.5 wt.% causes an increase of 37.36% in the yield, giving a yield of 85.39%. Similarly, increasing NaOH from 0.1 wt.% to 0.5 wt.% causes an increase of 25.11% in the yield, resulting a yield of 78.34%.

Keywords : Alkali Catalysis ; Biodiesel ; Waste Oil

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