

Yuttapong Tanawannapong 2012: Biodiesel Production from Waste Cooking Oil in a Microtube Reactor. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Attasak Jaree, Ph.D. 115 pages.

Waste cooking oil (WCO) was used as a feedstock to produce biodiesel by a two-step process in a microtube reactor (0.508 mm ID). In the first step, the acid value of the WCO was reduced from 3.96 mg KOH/g to less than 1 mg KOH/g via acid catalyzed esterification. The effects of the methanol-to-WCO molar ratio (4.5:1–18:1), the H_2SO_4 concentration (0.5–2 wt.%), reaction temperature (55–70°C) and reaction time (5–20 seconds) were studied. Results indicated that the optimum conditions were 9:1 methanol-to-WCO molar ratio, 1 wt.% H_2SO_4 , reaction temperature of 65°C and 5 seconds of reaction time. In the second step, triglycerides in the product from the first step were transesterified with methanol and alkaline catalyst to produce methyl esters and glycerol. The effect of the methanol-to-WCO molar ratio (4.5:1–12:1), the KOH concentration (0.5–2.5 wt.%), reaction temperature (50–70°C) and reaction time (5–20 seconds) were studied. Methyl ester content of 97.19% was obtained after the transesterification reaction in the second step under the optimal operating conditions : molar ratio of methanol-to-WCO of 6:1, KOH concentration 1.5 wt.%, reaction temperature of 60°C and the reaction time of 5 seconds. Finally, it was found that the properties of biodiesel produced by our two step process in a microtube reactor were compatible with ranges according to the department of energy (Thailand) standards for commerce biodiesel.

Student's signature

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