

THE CRAFT EXPLORATION OF BIODIESEL WITH LARD

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Introduction

Intensive uses of petroleum can results not only in energy crisis but also in severe pollution to natural environment. With the coming exhaustion of petroleum reserve, searching for a new energy to take the place of petroleum is brought forward. With high cetane value and without sulfur and the aromatic hydrocarbon, biodiesel is a bio-degradable, non-toxic and environmental-friendly fuel. When compared to diesel, the biodiesel can reduce air toxicity by 90%, cancer incidence by 94%. Biodiesel is also a safe fuel for both reverse and application due to its higher flash point. A lot of work has been done on the production of biodiesel with plant oil. Until now little report on the craft process of biodiesel with lard has been found.

Materials and methods

Experimental principle: Glyceryl of fatty clyceride of lard is replaced with methanol and long chain fatty acid methyl ester together with glycerin is formed. Thus the carbon chain is decreased and fluid performance is enhanced. The work flow is as flows: Lard, methanol and NaOH are put in the reactor and centrifuged to get the lower phase. The collected fluid are evaporated to get rid of methanol , and then washed with distilled water and petroleum ether respectively to get the upper phase. After the petroleum ether is separated by evaporation, the collection is dried to get the biodiesel.

Materials: Lard (Local Market); Methanol and NaOH (AR, Shenyang Chemical Reagent Ltd.); Electric blender (Hangzhou Lantian Instrument Ltd.); Water bath (Guohua Electric Instrument Ltd.); 500ml Three-mouthed Flask (Shenyang Yishen Apparatus and Chemical Ltd.).

Single factor experiment: Reaction conditions: 1% catalyst; reaction time 60min; temperature 60℃; methanol-fat ratio 6: 1. Single factor (catalyst amount, Methanol-fat ratio, Reaction time and Temperature) varied. NaOH amount: 0.8%, 0.9%, 1.0%, 1.1%, and 1.2%; Methanol-fat ratio: 4: 1, 5: 1, 6: 1, 7: 1, and 8: 1; Reaction time, 30, 45, 60, 75, and 90min; Temperature : 40, 50, 60, 70, and 80℃.

Results and Discussion

The effects of catalyst amount on the biodiesel productivity

When NaOH amount was 1% of the total animal fat, the highest yield of the biodiesel was realized. Less or more NaOH amount led to fewer yields (Fig 1). NaOH can be neutralized by dissociative fatty acids when less than 1%. The side reaction $(C_3H_5(RCOO)_3 + 3NaOH \rightarrow 3RCOONa + C_3H_5(OH)_3)$ would take place with more NaOH. Optimal biodiesel productivity hit 81.5% with NaOH amount 1% during our laboratory investigation.

The effects of methyl-lard ratio on biodiesel productivity

Almost no obvious effects of molar methyl-lard ratio on biodiesel productivity was found in Fig.1. Incomplete reaction caused by less methyl-lard ratio (< 6:1) resulted in lower productivity. The chemical equilibrium was promoted positively by more methyl and more biodiesel was produced. When the methyl-lard ratio hit 6:1, the maximum productivity (81.5%) of biodiesel was obtained. the productivity was decreased by continuous addition of methyl (> 6:1) because of more methyl resulted in less fat concentration.

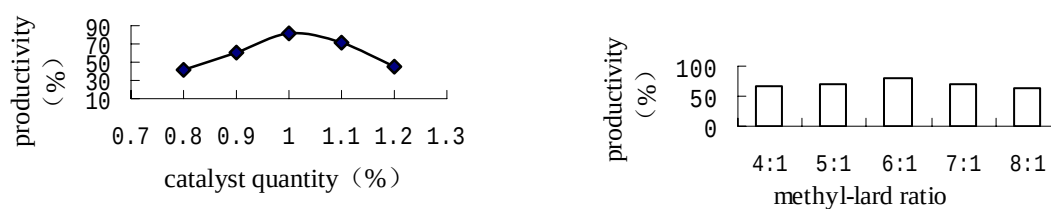


Figure 1. The effects of catalyst amount and methyl-lard ratio on the biodiesel productivity

The effects of temperatures on biodiesel productivity

The biodiesel productivity can be significantly affected by reaction temperature (Fig.2). Under the conditions of methyl-fat ratio 6:1, 1% NaOH used as catalyst and reaction time 60 min, maximum productivity was obtained at 60 °C, which was 81.5%. Higher or lower temperature led to less productivity.

The effects of reaction time on biodiesel productivity

Fig.2 showed that biodiesel productivity was not affected obviously by reaction time. Increase of time resulted in higher productivity due to better mixed reactants when reaction time was shorter than 60 min. After 75 min mixing, the reaction equilibrium was reached. No obvious productivity increase given more reaction time. The optimal reaction time range under our conditions was between 60 and 75 min and the productivity was 83.5%.



Figure 2. The effects of temperatures and reaction time on biodiesel productivity

Conclusions

The results showed that the optimal conditions for the transesterification were as follows: Molar ratio of methanol to lard was 6:1. NaOH amount was 1% of lard and the reaction time range was between 60 and 75 min under 60°C. The productivity turned out 80% or more under these conditions.

References (all in Chinese)

- 1.Cao L.K. et al.,(2005) Preparation technology and application prospect of biodiesel, *Agricultural Products Processing Publication*, (3):68.
- 2.He D.P. et al.,(2003) Research on production of biodiesel, *Engineering Collage Journal Of Wuhan Industry*, 22(4):52~53.
- 3.Liu Dan,(2005) preparation of biodiesel, *Nanjing Industrial University Master's Degree Paper*, 6:1~3.
- 4.Ma Junlin et al.,(2006) Preparation craft exploration of biodiesel with Soybean oil, *Renewable Energy*, 2:35~37.
- 5.Zhang Tian and Yuan Yinnan,(2005) Environmental benefit and social economic benefit of biodiesel, *Energy Environmental Protection*, 19(2):16~17.
- 6.Sheng M. et al.,(2004) Preparation of biodiesel. *Chemical Engineering Journal In Universities*, 18(2):233.