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A new co-solvent method for production of biodiesel fuel and its optimization toward the practical production

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The transesterification reaction of vegetable oil with methanol in the presence of acid or base catalysts occurs in a heterogeneous system because of their immiscible liquids. As a result, the reaction takes place slowly with low yield of fatty acid methyl esters (FAME) at a certain room temperature. To speed up the reaction rate and to increase the FAME yield, a homogeneous reaction process using acetone as a co-solvent for the transesterification has been developed. The objective of this work was to produce biodiesel satisfying the biodiesel fuel standards with low energy consumption and material savings. The influences of various main parameters on the transesterification reaction, including the amount of acetone to oil, the amount of catalyst, the molar ratio of methanol to oil, the reaction time and the reaction temperature, were investigated. The optimal conditions were the amount of acetone to oil, 25 wt.%; the amount of potassium hydroxide catalyst to oil, 1.0 wt.%; the molar ratio of methanol to oil, 4.5:1; the reaction time of 30 minutes; and at ambient temperature, 25 ± 1°C. Under these mild conditions, the conversion of waste cooking oil to FAME was larger than 98 %. This method has been successfully applied to produce biodiesel fuel from waste cooking, canola, catfish and *Jatropha curcas* oils with the main parameters of the product qualities satisfying the Japanese Industrial Standard (JIS K2390) for biodiesel fuel. Additionally, the kinetics of the transesterification reaction in the homogeneous system has also been elucidated.

Biography

Le Tu Thanh received his B.S. degree in analytical chemistry from Vietnam National University - Ho Chi Minh City, Vietnam in 1999 and his Doctor degree from Osaka Prefecture University, Japan in 2010. He has worked in a postdoctoral position with emeritus professor Yasuaki Maeda at Research Organization for University–Community Collaborations, Osaka Prefecture University since 2010. He has been involved in studies for development of the innovative methods for production of high quality of biodiesel from vegetable oils and animal fats. Recently, he has established a direct glycerin fuel cell using waste glycerin, a main by-product of biodiesel production.

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