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Biodiesel Production Using Alkaline Ionic Liquid and Adopted as Lubricity Additive for Low-Sulfur Diesel Fuel

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Abstract : Preparation of biodiesel from vegetable oils, such as rapeseed oil, soybean oil and sunflower oil, catalyzed by an alkaline ionic liquid 1-Butyl-3-methylimidazolium imidazolid ([Bmim]Im) was investigated in this work. The results demonstrated that [Bmim]Im exhibited high activity and the yield of biodiesel was up to 95 % or more when molar ratio of methanol to vegetable oil was 6:1, ionic liquid dosage was 6 wt%, reaction temperature was 60 °C, and reaction time was 60 min. After [Bmim]Im was used for the sixth time, the yield of biodiesel still remained at about 95%. The effects of the biodiesels on the lubricity of low-sulfur diesel fuel were also investigated using the High Frequency Reciprocating Rig method, and the results showed that sunflower biodiesel and soybean biodiesel had higher lubrication performance than that of rapeseed biodiesel.

Key words: Biodiesel; Alkaline ionic liquid; Transesterification; Lubricity

1. Introduction

Biodiesel has become more attractive nowadays because of the fact that it is environmentally friendly and is made from renewable resources (Ma and Hanna, 1999; Kalam and Masjuki, 2002). Biodiesel is usually prepared through the transesterification of vegetable oils or animal fats and the most commonly used oils are rapeseed, soybean, sunflower, palm, rapeseed, cotton seed and Jatropha (Singh and Singh, 2010). The transesterification could occur readily in the presence of acidic or basic catalyst. Homogeneous base and acid catalysts, such as NaOH, KOH and H₂SO₄, give good performance and cost-effectiveness for production biodiesel (Ma et al., 1999; Dorado et al., 2004; Vicente et al., 2004; Qian et al., 2008). However, it is difficult to separate the catalysts from the product mixture, and the separating process could produce a large amount of industrial wastewater. On the other hand, the use of acid and base catalysts could increase corrosiveness. Heterogeneous catalysts, such as

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