

Preparation and Characterization of Heterogeneous Catalyst from Gelam Wood (*Melaleuca leucadendron*) for Biodiesel Production

Abstract

abdullah Unlam, Azidi Irwan, Utami Irawati, Nor Ain, Nasrullah Hamdani, Akif Lanang Jaya

Recently, many researchers have explored the potential use of ash as a catalyst, due to the availability of various mineral elements in it. The ashes themselves can be obtained from various agricultural waste of biomass, including from the burning of woods. In this study, the ash that was used as a raw material for a heterogeneous catalyst was obtained from the burning of gelam wood (*Melaleuca leucadendron*). After the burning, the ash was sieved to have particles of homogenous size. The ash was then activated with a solution of 1 M H₂SO₄ and 0.1 M KOH, consecutively. Potassium was then impregnated onto the activated ash using 30% and 60% (w/w) KOH solution, followed by calcination at 800°C for 3 hours. The impregnated catalysts were then characterized with FTIR, XRD, and SEM-EDX. The catalyst was tested for its ability in the transesterification reaction of palm oil by varying the methanol to oil mole ratio, the amount of catalyst used, and the reaction time. The optimal reaction conditions for biodiesel production using this catalyst include a 12:1 methanol to oil mole ratio, 10.0% weight ratio of the catalyst (catalyst weight to the oil volume), 6 hours of reaction time at 65°C and stirring speed of 600 rpm. By using this catalyst, the biodiesel production reached up to 99.0% in conversion rate, with a product that satisfactorily meets the ASTM D-6751 standards in terms of its density, kinematic viscosity, and acid number.

Keywords

Catalyst; gelam wood ash; palm oil; biodiesel