ABSTRAK

Elfrida Siregar, Nim 4192510011 (2019). Konversi Minyak Biji Kemiri Menjadi Biodiesel Menggunakan Katalis CaO Cangkang Tutut Terimpregnasi NaOH dan Support Karbon Aktif Dengan Pemanasan Microwave

Bahan bakar minyak yang berasal dari fosil bersifat tidak dapat diperbahrui sehingga suatu waktu akan habis dan memberikan dampak negatif terhadap pencemaran udara. Dalam mengatasi hal tersebut perlu adanya bahan bakar alternatif ramah lingkungan dari sumber terbarukan seperti biodiesel. Pada penelitian ini konversi minyak biji kemiri menjadi biodiesel melalui proses esterifikasi dan transesterifikasi dengan pemanasan *microwave* menggunakan katalis CaO yang terimpregnasi logam NaOH dan adanya penambahan *support* karbon aktif. Tujuan penelitian ini untuk mengetahui pengaruh daya terhadap konversi minyak biji kemiri menjadi biodiesel baik ditinjau berdasarkan keseuaian terhadap standar SNI 7182-2015 maupun analisa menggunakan FT-IR dan GC-MS. Proses aktivasi fisik katalis Na/CaO/CA dilakukan dengan impregnasi basah dan kalsinasi pada suhu 500℃. Karakterisasi katalis meliputi instrumen XRD dan SAA. Analisa XRD menunjukkan bahwa telah terbentuk CaO pada 2θ = 32.19° 37.34° 53.85°. Hasil analisa SAA melalui metode BET dan BJH menunjukkan luas permukaan sebesar 9.306m^2/g, volume pori sebesar 0.033cc/g dan rerata diameter pori 14.043nm. Pada proses transesterifikasi digunakan variasi daya *microwave* yaitu 300, 450 dan 600 watt dengan rasio mol minyak:metanol adalah 1:10 dan waktu reaksi 3 menit. Daya microwave yang semakin meningkat memberikan peningkatan terhadap *yield* biodiesel. Yield biodiesel optimum yaitu pada daya 600 watt sebesar 85,625% dan pada daya 600 watt nilai densitas, viskositas kinematik, angka asam dan angka penyabunan telah sesuai standar SNI 7182-2015 biodiesel. Analisis karakteristik biodiesel menggunakan GC-MS memperoleh tiga komponen biodiesel yang paling optimum yaitu asam heksadekanoat, metil ester (22.664%), asam 9,12-Oktadekadienoik (Z,Z)-, metil ester (30.176%) dan asam 9-Oktadekenoik (Z)-, metil ester (38.656%).

Kata kunci: Minyak biji kemiri, Katalis Na/CaO/CA, Ester-Transesterifikasi, Biodiesel, Variasi daya microwave

ABSTRACT

Elfrida Siregar, Nim 4192510011 (2019). Conversion Of Candlenut Seed Oil into Biodiesel Using A CaO Catalyst Impregnated With NaOH and Activated Carbon Support With Microwave Heating

Oil fuels that come from fossils are non-renewable so they will eventually run out and have a negative impact on air pollution. To overcome this, there is a need for environmentally friendly alternative fuel from renewable sources such as biodiesel. In this research, the conversion of candlenut seed oil into biodiesel was carried out through an esterification and transesterification process with microwave heating using a CaO catalyst impregnated with NaOH metal and the addition of active carbon support. The aim of this research is to determine the effect of power on the conversion of candlenut seed oil into biodiesel, both based on compliance with the SNI 7182-2015 standard and analysis using FT-IR and GC-MS. The physical activation process of the Na/CaO/CA catalyst is carried out by wet impregnation and calcination at a temperature of 500℃. Catalyst characterization includes XRD and SAA instruments. XRD analysis shows that CaO has been formed at $2\theta = 32.19°\ 37.34°\ 53.85°$. The results of SAA analysis using the BET and BJH methods show a surface area of $9.306 m^2/g$, a pore volume of 0.033cc/g and an average pore diameter of 14.043nm. In the transesterification process, variations in microwave power were used, namely 300, 450 and 600 watts with a mole ratio of oil: methanol of 1:10 and a reaction time of 3 minutes. Increasing microwave power provides an increase in biodiesel yield. The optimum biodiesel yield is 85.625% at 600 watts of power and at 600 watts of power the density, kinematic viscosity, acid number and saponification value are in accordance with SNI 7182-2015 biodiesel standards. Analysis of biodiesel characteristics using GC-MS obtained the three most optimum biodiesel components, namely hexadecanoic acid, methyl ester (22.664%), 9,12-Oktadecadienoic acid (Z,Z)-, methyl ester (30.176%) and 9-Octadedecenoic acid (Z)-, methyl ester (38.656%).

Key words: Candlenut kernel oil, Na/CaO/CA catalyst, Ester-Transesterification, Biodiesel, Microwave power variations