PENGARUH RASIO MOL METANOL/MINYAK TERHADAP TRANSESTERIFIKASI MINYAK GORENG BEKAS MENGGUNAKAN KATALIS BASA NH_2/MCM-41 BERBASIS SILIKA LUMPUR SIDOARJO

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INTISARI

Telah dipelajari pengaruh rasio mol metanol/minyak terhadap transesterifikasi minyak goreng bekas menggunakan katalis basa NH_2/MCM-41 berbasis silika lumpur Sidoarjo. Ekstraksi silika dari lumpur Sidoarjo dilakukan dengan metode refluks menggunakan larutan HCl 6 M dan NaOH 6 M. Lumpur hasil refluks dianalisis dengan *X-ray Flouresense* (XRF).

MCM-41 disintesis menggunakan metode hidrotermal pada suhu 100 °C selama 24 jam dan dikalsinasi pada suhu 540 °C selama 5 jam. MCM-41 yang dihasilkan dianalisis menggunakan XRD, FTIR, GSA, dan TEM. Modifikasi MCM-41 dilakukan menggunakan metode *grafting* melalui penambahan 3-Aminopropiltrimetoksisilan (3-APTMS) dengan persen mol N/Si 5% untuk memperoleh NH_2/MCM-41. Katalis NH_2/MCM-41 dianalisis menggunakan FTIR dan GSA. Transesterifikasi minyak goreng bekas dilakukan dengan kondisi rasio mol metanol/minyak 6, 9, 12, 15, dan 18 serta katalis 10% (b/b) terhadap minyak selama 2 jam. Produk transesterifikasi dianalisis menggunakan GC-MS.

Hasil analisis TEM dan GSA menunjukkan MCM-41 merupakan material mesopori. MCM-41 dan NH_2/MCM-41 hasil sintesis memiliki luas permukaan 830,823 dan 379,578 $m^2\ g^{-1}$; diameter pori 3,19 dan 2,48 nm; volume pori 0,248 dan 0,123 cc g^{-1}. Konversi metil ester tertinggi diperoleh pada kondisi rasio mol metanol/minyak 12 yaitu 42,47% (b/b).

Kata kunci: Lumpur Sidoarjo, NH_2/MCM-41, metanol/minyak, transesterifikasi, minyak goreng bekas

EFFECT OF METHANOL/OIL MOL RATIOS TOWARD WASTE COOKING OIL TRANSESTERIFICATION USING NH_2/MCM-41 BASE CATALYST BASED ON SILICA OF SIDOARJO MUD

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ABSTRACT

Effect of methanol/oil mol ratios toward waste cooking oil transesterification using NH_2/MCM-41 base catalyst based on silica of Sidoarjo mud had been studied. Sillica extraction was done by reflux method using HCl 6 M and NaOH 6 M. The product was then analyzed by X-ray Flouresence (XRF).

The MCM-41 was synthesized by hydrothermal method at 100 °C for 24 h and calcined at 540 °C for 5 h. MCM-41 was then characterized by XRD, FTIR, GSA, and TEM. MCM-41 was modified using 3-Aminopropyltrimethoxysilane (3-APTMS) by grafting method under N/Si mol percent ratio 5% to produce NH_2/MCM-41 base catalyst. Catalyst NH_2/MCM-41 was analyzed by FTIR and GSA. Transesterification was carried out under methanol/oil mol ratio of 6, 9, 12, 15 and 18 with 10 wt.% of catalyst toward oil. Transesterification products were characterized by GC-MS.

TEM and GSA analysis results showed that MCM-41 had a mesoporus structure. The MCM-41 and NH_2/MCM-41 had specific surface area of 830.823 and 379.578 $m^2\ g^{-1}$; pore diameter 3.19 and 2.48 nm; pore volume 0.248 and 0.123 cc g^{-1}. The highest production (wt%) of methyl ester was obtained by methanol/oil mol ratio of 12 i.e. 42.47%.

Keywords: Sidoarjo mud, NH_2/MCM-41, methanol/oil, transesterification, waste cooking oil