

**SINTESIS DAN KARAKTERISASI KATALIS BIFUNGSIONAL  
Co-NH<sub>2</sub>/SILIKA MESOPORI UNTUK KONVERSI MINYAK GORENG  
BEKAS MENJADI *BIOFUEL***

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**INTISARI**

Telah dilakukan sintesis dan karakterisasi katalis bifungsional Co-NH<sub>2</sub>/Silika mesopori untuk konversi minyak goreng bekas menjadi *biofuel*. Sintesis silika mesopori (SM) dilakukan dengan menggunakan metode hidrotermal berbahan silika lumpur Lapindo dan gelatin tulang sapi sebagai cetakan dengan variasi rasio berat silika/gelatin: 4, 6, dan 8 berturut-turut menghasilkan SM4, SM6, dan SM8. SM yang dihasilkan dikarakterisasi dengan FTIR. Silika mesopori dengan kandungan gelatin minimum setelah kalsinasi (SM<sub>x</sub>) dikarakterisasi dengan TEM dan SAA (*Surface Area Analyzer*). Pengembunan logam Co ke dalam SM<sub>x</sub> dilakukan dengan menggunakan metode impregnasi basah. Katalis Co/SM<sub>x</sub> yang dihasilkan dikarakterisasi dengan XRF dan uji keasaman dengan adsorpsi uap NH<sub>3</sub>. Fungsionalisasi gugus NH<sub>2</sub> pada SM<sub>x</sub> dan Co/SM<sub>x</sub> dilakukan dengan menggunakan metode *grafting*. Katalis NH<sub>2</sub>/SM<sub>x</sub> dan katalis bifungsional Co-NH<sub>2</sub>/SM<sub>x</sub> yang dihasilkan dikarakterisasi dengan FTIR. Uji aktivitas katalitik pada hidrorengkah minyak goreng bekas dilakukan dengan variasi termal (tanpa katalis), katalis campuran Co/SM<sub>x</sub> dan NH<sub>2</sub>/SM<sub>x</sub>, serta katalis bifungsional Co-NH<sub>2</sub>/SM<sub>x</sub>. Rasio berat minyak goreng bekas/katalis adalah 5. Hasil produk hidrorengkah yang dihasilkan dianalisis dengan GC-MS.

Hasil penelitian menunjukkan bahwa SM dengan kandungan gelatin minimum setelah proses kalsinasi adalah SM8. SM8 memiliki diameter pori 4,9 nm, luas permukaan spesifik 666,76 m<sup>2</sup>/g, dan volume pori 0,46 cm<sup>3</sup>/g. Katalis bifungsional Co-NH<sub>2</sub>/SM8 menghasilkan produk cair terbanyak yaitu 97,62% (b/b) pada hidrorengkah minyak goreng bekas dengan selektivitas fraksi bensin dan solar sebesar 3,02 dan 46,86% (b/b).

Kata kunci: gelatin, lumpur Lapindo, silika mesopori, katalis bifungsional, *biofuel*

## **SYNTHESIS DAN CHARACTERIZATION OF Co-NH<sub>2</sub>/MESOPOROUS SILICA BIFUNCTIONAL CATALYST FOR CONVERSION OF WASTE COOKING OIL INTO BIOFUEL**

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### **ABSTRACT**

Synthesis and characterization of Co-NH<sub>2</sub>/mesoporous silica bifunctional catalyst for conversion of waste cooking oil into biofuel was carried out. Synthesis of the mesoporous silica (SM) was done by hydrothermal method using silica from Lapindo mud and gelatin from bovine bone as a template with weight ratio variation of silica/gelatin: 4, 6, and 8 produced SM4, SM6, and SM8 respectively. SM was characterized using FTIR. The mesoporous silica with minimum gelatin content after calcination (SM<sub>x</sub>) was characterized using TEM and SAA (Surface Area Analyzer). The impregnation of Co into the SM<sub>x</sub> was done by wet impregnation method. The Co/SM<sub>x</sub> catalyst was characterized using XRF and acidity test with NH<sub>3</sub> vapour adsorption. Functionalization of NH<sub>2</sub> into the SM<sub>x</sub> and Co/SM<sub>x</sub> was done by grafting method. The NH<sub>2</sub>/SM<sub>x</sub> catalyst and Co-NH<sub>2</sub>/SM<sub>x</sub> bifunctional catalyst was characterized using FTIR. The catalytic activity was tested in waste cooking oil hydrocracking was done by thermal (without catalyst), physical mixture catalyst of Co/SM<sub>x</sub> and NH<sub>2</sub>/SM<sub>x</sub>, and Co-NH<sub>2</sub>/SM<sub>x</sub> bifunctional catalyst. The weight ratio of waste cooking oil/catalyst was 5. The result liquid product of hydrocracking was analyzed using GC-MS.

The results showed that SM with minimum gelatin content after calcination was SM8. The SM8 has pore diameter of 4.9 nm, the specific surface area of 666.76 m<sup>2</sup>/g, and pore volume of 0.46 cm<sup>3</sup>/g. The Co-NH<sub>2</sub>/SM8 bifunctional catalyst produced the highest liquid products of 97.62 %wt in the hydrocracking of waste cooking oil with selectivity for gasoline and solar fraction was 3.02 and 46.86 %wt.

Keywords: gelatin, mud Lapindo, mesoporous silica, bifunctional catalyst, biofuel