

**PENGARUH KONDISI REAKSI DAN JUMLAH LOGAM Co TERHADAP
AKTIVITAS DAN SELEKTIVITAS KATALIS Co/LUMPUR LAPINDO
PADA *HYDROTREATMENT* MINYAK SAWIT BEKAS MENJADI
*BIOFUEL***

Novia Cahya Ningrum

16/398595/PA/17556

INTISARI

Telah dilakukan sintesis dan karakterisasi katalis Co/Lumpur Lapindo dari lumpur Lapindo untuk *hydrotreatment* minyak sawit bekas menjadi *biofuel*. Tujuan penelitian ini untuk menyelidiki pengaruh kondisi reaksi dan jumlah logam kobalt terhadap aktivitas dan selektivitas katalis Co/LL. Katalis dipreparasi melalui impregnasi basah menggunakan garam prekursor $\text{CoCl}_6 \cdot \text{H}_2\text{O}$, dengan variasi konsentrasi awal Co terhadap lumpur Lapindo yaitu 2, 6, dan 10% untuk menghasilkan katalis Co(a)/LL, Co(b)/LL, dan Co(c)/LL. Katalis dikalsinasi dengan gas N_2 dan direduksi dengan gas H_2 masing-masing pada suhu 500°C selama 3 jam. Katalis dikarakterisasi dengan FT-IR, XRD, SEM-EDX, BET/BJH dan uji keasaman dengan gravimetri. Uji hidrotermal dilakukan pada umpan minyak sawit bekas sebanyak 10g dengan suhu 450, 475, dan 500°C . Proses *hydrotreatment* dilakukan pada suhu optimum hidrotermal yang menghasilkan fraksi cair tertinggi pada variasi rasio berat umpan/katalis 1:50; 1:75; dan 1:100 menggunakan katalis Co(a)/LL. Proses *hydrotreatment* dilanjutkan dengan suhu dan rasio berat umpan/katalis optimum pada katalis Co(b)/LL dan Co(c)/LL. Variasi katalis yang menghasilkan fraksi cair tertinggi digunakan untuk uji masa pakai. Produk cair hasil *hydrotreatment* dianalisis GC-MS.

Hasil penelitian menunjukkan bahwa pada katalis Co(a)/LL, Co(b)/LL, dan Co(c)/LL kandungan Co yang berhasil diimbangkan masing-masing sebesar 6, 18, dan 36 %b/b; area permukaan spesifik (m^2/g) dan diameter pori (nm) masing-masing 4,55 dan 7,72; 10,62 dan 9,41; 13,84 dan 8,61; dengan nilai keasaman masing-masing 1,7854; 2,7133; dan 3,1679 mmol/g. Suhu dan rasio berat katalis/umpan yang menghasilkan fraksi cair tertinggi adalah 450°C and 1:100. Katalis Co(c)/LL memiliki hasil terbaik pada selektivitas terhadap *biofuel* sebanyak 56,67 %b/b. Fraksi cair tertinggi (91,07 %b/b) dihasilkan oleh Co(b)/LL yang kemudian digunakan untuk uji masa pakai.

Kata kunci: katalis, kobalt, *hydrotreatment*, lumpur Lapindo, dan minyak sawit bekas.

*EFFECT OF REACTION CONDITIONS AND COBALT CONTENT ON THE
ACTIVITY AND SELECTIVITY OF THE Co/LAPINDO MUD CATALYST FOR
THE HYDROTREATMENT OF USED PALM OIL INTO BIOFUELS*

Novia Cahya Ningrum

16/398595/PA/17556

ABSTRACT

The synthesis and characterization of Co/Lumpur Lapindo (Co/LL) catalysts from Lapindo mud for the hydrotreatment of used palm oil into biofuel has been conducted. The purpose of this research is to investigate the effect of reaction conditions and cobalt content towards activity and selectivity of Co/LL catalysts. The catalysts were prepared by wet impregnation method using salt precursor $\text{CoCl}_6 \cdot \text{H}_2\text{O}$, under variation of initially Co content of 2, 6, 10 wt% based on the LL weight to produce Co(a)/LL, Co(b)/LL, and Co(c)/LL catalyst, respectively. The catalysts were calcined with N_2 gas and reduced with H_2 gas each at 500°C for 3 h. The catalysts were then characterized by FT-IR, XRD, SEM-EDX, BET/BJH, and acidity test by gravimetric method. Hydrothermal test was carried out for 10g used palm oil on temperature of 450, 475, and 500°C . Hydrotreatment was carried out at the optimum hydrothermal temperature which produced the highest liquid fraction on the variation of catalyst/feed weight ratio 1:50; 1:75; 1:100 using Co(a)/LL catalyst. Hydrotreatment was then carried out under optimum temperature and catalyst/feed weight ratio using the Co(b)/LL and Co(c)/LL. Catalyst that produce the highest liquid fraction was then tested for the usability. The liquid products were analyzed by GC-MS.

The results showed that Co(a)/LL, Co(b)/LL, and Co(c)/LL catalyst consisted of Co metal 6, 18, and 36 wt.%, respectively; the specific surface area (m^2/g) and pore diameter (nm) 4.55 and 7.728, 10.616 and 9.408, 13.836 and 8.609, respectively; the acidity 1.7854, 2.7133, and 3.1679 mmol/g, respectively. The temperature and catalyst/feed weight ratio that produced the highest liquid fraction was 450°C and 1:100. The Co(c)/LL catalyst showed the best performance in selectivity towards biofuels of 52,67 wt %. The highest liquid fraction (91.07 wt%) was produced by Co(b)/LL which then tested for the usability.

Keywords: catalyst, cobalt, hydrotreatment, lapindo mud, and used palm oil.