

PENGARUH KANDUNGAN LOGAM Mo TERHADAP KARAKTER DAN AKTIVITAS KATALIS Mo/H-ZSM-5 UNTUK HIDRODEOKSIGENASI REFINED PALM KERNEL OIL (RPKO) MENJADI BIOAVTUR

Anadea Salsabilla Rahma

19/439168/PA/18991

INTISARI

Preparasi katalis Mo/H-ZSM-5 dengan variasi konsentrasi logam Mo melalui metode impregnasi kering telah dilakukan. Tujuan dari penelitian ini adalah untuk mempelajari pengaruh jumlah Mo terimpregnasi pada H-ZSM-5 terhadap aktivitas katalis Mo/H-ZSM-5 dalam hidrodoksigenasi (HDO) *Refined Palm Kernel Oil* (RPKO) menjadi bioavtur dan uji *usability* HDO RPKO. Umpan RPKO diperoleh dari hasil *degumming* dan *bleaching* terhadap PKO kemudian dianalisis menggunakan GC-MS. Impregnasi logam Mo dilakukan dengan cara semprot (*spray*) menggunakan larutan prekursor amonium heptamolidat ((NH₄)₆Mo₇O₂₄·4H₂O) dengan jumlah logam Mo awal 5, 10, dan 15% terhadap berat H-ZSM-5 berturut-turut menghasilkan katalis 5-Mo/Z, 10-Mo/Z, dan 15-Mo/Z. Katalis dikarakterisasi menggunakan FT-IR, XRD, SEM-EDX, SAA, dan NH₃-TPD. Uji aktivitas katalis dilakukan pada HDO RPKO menggunakan reaktor semi-batch dengan pemanas ganda dalam sistem *one-pot* (*semi-batch reactor with double furnace in one-pot system*). Produk cair hasil reaksi HDO RPKO dianalisis menggunakan GC-MS. Katalis penghasil produk cair terbanyak dilakukan uji masa pakai (*usability*) dalam tiga kali siklus reaksi (*running*) HDO RPKO.

Hasil penelitian menunjukkan bahwa RPKO mengandung senyawa dominan asam laurat (54,70%) dan asam miristat (16,27%). Kandungan logam Mo yang terdeteksi SEM-EDX dalam katalis 5-Mo/Z, 10-Mo/Z, 15-Mo/Z berturut-turut adalah 4,92; 24,88; dan 23,50%. Katalis 5-Mo/Z merupakan katalis penghasil produk cair tertinggi (46,82%) dengan *yield* bioavtur sebesar 42,94%. Katalis ini memiliki luas permukaan spesifik, volume pori total, keasaman total tertinggi berturut-turut sebesar 191,44 m²/g, 0,12 cm³/g, dan 10,63 mmol/g. Uji *usability* menunjukkan bahwa katalis 5-Mo/Z masih memiliki performa yang menjanjikan setelah tiga kali pemakaian dalam HDO umpan RPKO dengan hasil produk cair pemakaian kedua dan ketiga masing-masing sebesar 33,75 dan 33,71% dengan *yield* senyawa bioavtur 31,66 dan 30,96%.

Kata kunci: hidrodoksigenasi, katalis Mo/H-ZSM-5, *Refined Palm Kernel Oil*.

**THE EFFECT OF Mo METAL CONTENT ON THE CHARACTER AND
ACTIVITY OF THE Mo/H-ZSM-5 CATALYST FOR
HYDRODEOXYGENATION OF REFINED PALM KERNEL OIL (RPKO)
INTO BIOAVTUR**

Anadea Salsabilla Rahma
19/439168/PA/18991

ABSTRACT

Preparation of Mo/H-ZSM-5 catalyst with various concentrations of Mo metal by dry impregnation method has been carried out. The objective of this research was to study the effect of the Mo-impregnated amount on H-ZSM-5 towards its activity and selectivity in hydrodeoxygenation (HDO) reaction for Refined Palm Kernel Oil (RPKO) into bioavtur. The RPKO sample was degummed and bleached then analyzed using GC-MS. Impregnation of Mo metal was done using ammonium heptamolydate $((\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O})$ as a precursor solution with initial Mo contents of 5, 10, and 15 wt% towards H-ZSM-5 weight to produce 5-Mo/Z, 10-Mo/Z, and 15-Mo/Z, respectively. The catalysts were characterized using FT-IR, XRD, SEM-EDX, SAA, and NH_3 -TPD. The catalyst activity test was applied at HDO for RPKO using a semi-batch reactor with double furnace in one-pot system. The liquid product from the HDO for RPKO reaction was analyzed using GC-MS. The catalyst which produced the highest amount of liquid products was carried out for usability test in three reaction cycles (running) HDO for RPKO.

The results showed that RPKO consisted mainly of laurate (54.70 wt%) and myristate acid (16.27 wt%). The amount of Mo metals in 5-Mo/Z, 10-Mo/Z, and 15-Mo/Z detected by SEM-EDX was respectively 4.92, 24.88, and 23.50 wt%. The 5-Mo/Z catalyst produced the highest amount of liquid products (46.82 wt%) with bioavtur *yield* of 42.94 wt%. This catalyst has the highest specific surface area, total pore volume, and total acidity of 191.44 m^2/g , 0.12 cm^3/g , and 10.63 mmol/g, respectively. The usability test showed that the 5-Mo/Z catalyst still had a promising performance after three runs in the HDO for RPKO with the second and third run liquid product *yields* of 33.75 and 33.71 wt% with bioavtur *yield* of 31,66 and 30,96 wt%.

Keywords: hydrodeoxygenation, Mo/H-ZSM-5 catalyst, Refined Palm Kernel Oil.