SINTESIS KATALIS Ni/MORDENIT UNTUK *HYDROTREATING* MINYAK KULIT BIJI JAMBU METE MENJADI *BIOFUEL*

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INTISARI

Sintesis katalis Ni/Mordenit (Ni/Mor) dan *hydrotreating* minyak kulit biji jambu mete menjadi *biofuel* telah dilakukan. Tujuan penelitian ini adalah sintesis katalis Ni/Mor untuk *hydrotreating Cashew Nut Shell Liquid Oil (*CNSLO), menguji pengaruh logam Ni yang teremban pada Mor terhadap situs asam total, aktivitas dan selektivitas katalis, membandingkan aktivitas *hydrotreating* CNSLO secara termal dan katalitik dalam pembentukan produk cair.

Katalis Ni/Mor dipreparasi dengan metode impregnasi basah menggunakan larutan garam $Ni(NO_3)_2 \cdot 6H_2O$ dan Mor yang dilarutkan dalam metanol dan dilakukan pengeringan, kalsinasi, dan reduksi. *Hydrotreating* dilakukan dalam reaktor *stainles steel semi-batch* yang dialiri gas H_2 dengan laju alir 20 mL/menit. Katalis dikarakterisasi dan dianalisis dengan FTIR, XRD, SEM-EDX, TEM, GSA dan AAS. Uji keasaman dilakukan dengan metode gravimetri menggunakan uap amonia. Produk cair hasil *hydrotreating* dikarakterisasi dengan GC-MS.

Logam Ni berhasil diembankan pada Mor berdasarkan hasil analisis dengan AAS dan karakterisasi dengan SEM-EDX, dan TEM. Pengembanan logam Ni pada Mor tidak merusak struktur dan kristalinitas material awal diketahui dalam spektra IR dan XRD. Berdasarkan analisis dengan GSA terjadi penurunan luas permukaan dan distribusi pori setelah pengembanan logam Ni. Situs asam total Mor, Ni(A)/Mor, Ni(B)/Mor dan Ni(C)/Mor berturut turut yaitu 5,729; 7,751; 9,038 dan 11,637 mmol g^{-1}. Produk cair hasil *hydrotreating* CNSLO secara termal, menggunakan katalis Mor, Ni(A)/Mor, Ni(B)/Mor dan Ni(C)/Mor berturut turut adalah 40,01; 49,64; 51,55; 66,34 dan 73,50% (b/b). Selektivitas katalis terhadap produk *hydrotreating* CNSLO menghasilkan fraksi bensin sebagai produk utama. Fraksi bensin dari *hydrotreating* CNSLO secara termal, menggunakan katalis Mor, Ni(A)/Mor, Ni(B)/Mor dan Ni(C)/Mor berturut turut adalah 33,98; 36,93; 37,06; 37,85 dan 40,84% (b/b).

Kata kunci: *Hydrotreating*, katalis, mordenit, nikel

SYNTHESIS OF Ni /MORDENITE CATALYST FOR HYDROTREATING OF CASHEW NUT SHELL LIQUID OIL TO EBIOFUEL

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ABSTRACT

Synthesis of Ni/Mordenite (Ni/Mor) catalysts and hydrotreating of cashew nut shell liquid oil to biofuel has been conducted. The purpose of this riset was to synthesis and characterization Ni/Mor catalyst for the hydrotreating of Cashew Nut Shell Liquid Oil (CNSLO), determine the effect of Ni content amount on the Mor toward total acid site, activity and selectivity of the catalyst, comparing the thermal and catalytic hydrotreating of CNSLO.

Ni/Mor catalyst was prepared by wet impregnation method using $Ni(NO_3)_2 \cdot 6H_2O$ and mor salts which were dissolved in methanol and carried out drying, calcination, and reduction. Hydrotreating wass carried out in a semi-batch reactor which was fed with H_2 gas with a flow rate of 20 mL/min. The catalyst was characterized and analyzed by (FTIR), (XRD), (SEM-EDX), (TEM) and (AAS). The total acid site test was carried out using the gravimetric method using ammonia vapor. The hydrotreatment liquid product was analyzed by GC-MS.

Ni metal was successfully impregnated on the Mor based on the results of analysis by Aas and characterization by SEM-EDX, and TEM. The Ni impregnated on the Mor didn't damage the structure and crystallinity of the initial material was known in IR and XRD spectra. Based on the analysis with GSA, there were decrease in surface area and pore distribution after Ni metals were impregnated. The total acid site amount of the Mor, Ni(A)/Mor, Ni(B)/Mor and Ni(C)/Mor were 5.729; 7.751; 9.038 dan 11.637 mmol g^{-1}, respectively. The catalyst activity towards the liquid product of hydrotreating the CNSLO thermal, the Mor, Ni(A)/Mor, Ni(B)/Mor and Ni(C)/Mor catalysts were 40.01, 49.64, 51.55, 66.34 and 73.50 wt%, respectively. The selectivity of the catalysts towards gasoline fraction produced by thermall, the MOR, Ni (A)/MOR, Ni(B)/MOR and Ni(C)/MOR catalysts were 33.9, 36.93, 37.06, 37.85 and 40.84 wt%, respectively.

Key word: Catalyst, hydrotreating, mordenite, nickel