



KATALIS Ni- Al_2O_3 -BENTONIT UNTUK HIDRORENGKAH MINYAK SAWIT MENJADI *BIOFUEL*

Resy Norma Annisa
11/316892/PA/14011

INTISARI

Telah dipelajari pembuatan katalis Ni- Al_2O_3 -bentonit untuk proses hidrorengkah minyak sawit menjadi *biofuel*. Tujuan dari penelitian ini adalah untuk membuat katalis Ni- Al_2O_3 -bentonit, mengkaji sifat fisikokimiawinya, serta menguji aktivitas katalitiknya sebagai katalis dalam reaksi hidrorengkah minyak sawit. Penelitian diawali dengan melakukan preparasi berupa pencucian bahan baku bentonit dengan akuades dan HF 1%. Bentonit kemudian diaktivasi dengan asam sulfat 1,2 M. Selanjutnya bentonit dipilarisasi dengan agen pemilar polikation $[\text{Al}_{13}]^{7+}$. Garam $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ kemudian diembankan kedalam bentonit terpillar sehingga didapatkan Ni- Al_2O_3 -bentonit. Bentonit-bentonit yang telah dimodifikasi ini kemudian dikarakterisasi dengan metode AAS, XRF, XRD, BET, TEM, FT-IR, dan uji keasaman amoniak. Bentonit-bentonit termodifikasi ini diuji aktivitas katalitiknya dengan menjadi katalis pada reaksi hidrorengkah minyak sawit. Reaksi hidrorengkah dilakukan pada suhu 500 °C selama 1 jam. Produk hidrorengkah ini lalu dikarakterisasi dengan GC-MS.

Dari hasil penelitian didapatkan bahwa modifikasi bentonit berupa aktivasi, pilarisasi, dan impregnasi dapat meningkatkan sifat fisikokimia bentonit, seperti sifat keasaman dan *basal space*. Akan tetapi, pemiliran dan pengembangan bentonit secara menurunkan luas permukaan spesifik dan volume pori. Hidrorengkah minyak sawit dengan katalis bentonit termodifikasi menghasilkan produk berfasa padat, cair, dan gas. Hasil analisis menunjukkan produk cair hasil hidrorengkah ini memiliki komposisi yang lebih mirip dengan fraksi minyak diesel daripada bensin. Dibandingkan dengan reaksi hidrorengkah dengan menggunakan katalis H-bentonit dan Al_2O_3 -bentonit, hidrorengkah dengan Ni- Al_2O_3 -bentonit mampu menghasilkan produk cair terbanyak, yaitu 46,32%. Produk cair hasil hidrorengkah dengan Ni- Al_2O_3 -bentonit juga memiliki persentase kandungan fraksi minyak diesel terbesar, yaitu 61,20%.

Kata kunci: bentonit, pilarisasi, impregnasi, minyak sawit, hidrorengkah.



NICKEL-Al₂O₃-BENTONITE FOR HYDROCRACKING OF PALM OIL INTO BIOFUEL

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ABSTRACT

Synthesis of Ni-Al₂O₃-bentonite for hydrocracking process of palm oil into biofuel has been conducted. The purposes of this research were to synthesize Ni-Al₂O₃-bentonite, to study its physicochemical properties, and to test its ability as the hydrocracking catalyst of palm oil. The research began by cleaning up bentonite with distilled water and HF 1%. Bentonite was then activated with sulphuric acid 1.2 M. The activated bentonite was pillared with pillaring agent [Al₁₃]⁷⁺ polycation and calcined to be Al₂O₃-bentonite. Finally, the pillared bentonite was impregnated with NiCl₂·6H₂O and calcined to be Ni-Al₂O₃-bentonite. Modified bentonites were characterized with AAS, XRF, XRD, BET, TEM, FT-IR, and ammonia acidity test. To test the catalytic activities, modified bentonites were used as the catalysts of hydrocracking reactions of palm oil. The hydrocracking processes were conducted in 500 °C for 1 hours. The products of hydrocracking reactions were characterized with GC-MS.

The results showed that modifications of bentonite, which were activation, pillarization, and impregnation could increase the physicochemical properties of the modified bentonites, such as acidity and basal spacing. Pillarization and impregnation generally lowered the surface area and pore volume. The hydrocracking process of palm oil using modified bentonite catalysts resulted in solid, liquid, and gaseous products. The analyses results showed that the liquid products had more similar compositions to those of diesel oil than those of gasoline fractions. Compared to hydrocracking with H-bentonite and Al₂O₃-bentonite, hydrocracking with Ni-Al₂O₃-bentonite resulted in the most liquid product of all, which was 46.32%. It also had the highest percentage of diesel oil fraction of all hydrocracking products, which was 61.20%.

Key words: bentonite, pillarization, impregnation, palm oil, hydrocracking.