

**MODIFIKASI KARAKTER MORDENIT MELALUI PERLAKUAN
H₂C₂O₄ DAN/ATAU NaOH DAN UJI AKTIVITAS KATALIS DALAM
HYDROTREATING α -SELULOSA TERPIROLISIS**

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INTISARI

Penelitian tentang modifikasi karakter mordenit telah dilakukan melalui perlakuan H₂C₂O₄ dan/atau NaOH dan uji aktivitas katalis dalam *hydrotreating* α -selulosa terpirolisis. Pada penelitian ini digunakan mordenit komersial (HSZ-604OA) yang digunakan sebagai mordenit kontrol (HM), kemudian mordenit direfluks dengan larutan asam oksalat (H₂C₂O₄) pada 70 °C selama 3 jam, dengan variasi konsentrasi 0,05;0,5; dan 1,0 M dihasilkan HM-0,05, HM-0,5, dan HM-1. Kemudian keempat mordenit tersebut diberi perlakuan basa (NaOH 0,1 M selama 15 menit) dihasilkan BHM, BHM-0,05, BHM-0,5, dan BHM-1. Karakterisasi kristalinitas mordenit dianalisis dengan *X-Ray Diffraction* (XRD), rasio Si/Al dengan *Indutively Coupled Plasma* (ICP), analisis karakter pori mordenit dengan perlakuan NaOH menggunakan *Surface Area Analyzer* (SAA), serta uji keasaman mordenit dengan menggunakan metode adsorpsi uap basa ammonia serta dihitung secara kuantitatif dengan metode gravimetri. Selanjutnya, katalis diuji aktivitasnya untuk proses *hydrotreating* α -selulosa terpirolisis dengan laju alir gas H₂ 20 mL menit⁻¹ pada temperatur 450 °C dengan rasio berat katalis:umpan sebesar 1:60. Produk cair yang diperoleh dari proses *hydrotreating* kemudian dianalisis menggunakan GC-MS.

Hasil penelitian menunjukkan adanya kenaikan rasio Si/Al dari mordenit diikuti penurunan kristalinitas setelah diberi perlakuan H₂C₂O₄ dan/atau perlakuan NaOH. Keasaman mordenit mengalami penurunan seiring dengan kenaikan rasio Si/Al. Diameter pori rata-rata mordenit BHM, BHM-0,05, BHM-0,5 dan BHM-1 berturut-turut sebesar 2,898; 3,005; 3,792; dan 7,429. Mordenit BHM-0.5 menunjukkan aktivitas katalitik tertinggi dalam menghasilkan produk cair sebesar 88,88 % (b/b) dan selektivitas terhadap propanol 5,48 % (b/b). Mordenit BHM-1 menunjukkan aktivitas katalitik produksi fraksi cair 41,16 % (b/b) dan selektivitas terhadap etanol 2,94 % (b/b).

Kata kunci : Perlakuan H₂C₂O₄, perlakuan NaOH, *hydrotreating* α -selulosa, mordenit, struktur mesopori.

***MODIFICATION OF MORDENITE CHARACTERS BY H₂C₂O₄ AND/OR
NaOH TREATMENTS AND CATALYST ACTIVITY TEST IN
HYDROTREATING OF α-CELLULOSE PYROLYZED***

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ABSTRACT

The research about modification of mordenite characters has been performed H₂C₂O₄ and/or NaOH treatments and catalyst activity test in hydrotreating of pyrolyzed α-cellulose. Commercial mordenite (HSZ-604OA) as mordenite control (HM) immersed in 0.05;0.5 and 1.0 M H₂C₂O₄ at 70 °C for three hours resulting HM-0.05, HM-0.5 and HM-1. The four mordenite were immersed in 0.1 M NaOH for 15 minutes resulting BHM, BHM-0.05, BHM-0.5 and BHM-1. Crystallinity of the mordenites was analyzed using X-ray Diffraction (XRD), Si/Al ratio using Inductively Coupled Plasma (ICP), analyzed their pore characters by Surface Area Analyzer (SAA) for mordenite with alkaline treatment, and their acidity test using ammonia vapour adsorption (gravimetric method). Catalyst activity of the mordenites was evaluated in hydrotreating of α-cellulose pyrolyzed using stainless steel reactor with H₂ gas flow rate of 20 mL min⁻¹ at 450 °C for two hours with catalyst:feed weight ratio of 1:60. The liquid products obtained from the hydrotreating were analyzed using GC-MS.

The research results showed that the H₂C₂O₄ and/or NaOH treatment towards the mordenites increased Si/Al ratio and decreased crystallinity. The acidity of mordenites decreased along with the increase of Si/Al ratio. The average pore diameter of BHM, BHM-0.05, BHM-0.5, and BHM-1 mordenites were 2.898; 3.005; 3.792; 7.429 nm respectively. The BHM-0.5 mordenite showed the highest catalytic activity in generating liquid product (88.88 wt%) and selectivity toward propanol (5.48 wt%). The BHM-1 mordenite showed catalytic activity in generating liquid product (41.16 wt%) and selectivity toward ethanol (2.94 wt%).

Keywords: H₂C₂O₄ treatment, NaOH treatment, α-cellulose hydrotreating, mordenite, mesoporous structure.