

SINTESIS METIL ISOBUTIL KETON DARI ISOPROPANOL MENGGUNAKAN KATALIS Pt/KARBON AKTIF

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INTISARI

Telah dilakukan penelitian sintesis metil isobutil keton (MIBK) dari isopropanol menggunakan katalis Pt/karbon aktif (Pt/KA). Tujuan penelitian ini antara lain mempelajari pengaruh pencucian karbon dengan HCl terhadap kandungan logam pengotor, pengaruh pengembangan logam Pt terhadap keasaman katalis, dan mengetahui optimum temperatur, massa katalis, serta laju alir isopropanol yang mampu menghasilkan produk MIBK paling banyak.

Tempurung kelapa dikarbonisasi selama 4 jam pada temperatur 600 °C. Aktivasi fisika karbon dilakukan dengan mengalirkan gas CO₂ melalui sampel pada temperatur 850 °C, sedangkan aktivasi kimia dilakukan dengan cara mencuci karbon dengan aseton dan HCl 1,0 M. Logam Pt didispersikan dalam pori karbon aktif dengan cara impregnasi basah. Katalis Pt/KA kemudian direduksi dengan aliran gas H₂ pada temperatur 400 °C. Keasaman katalis ditentukan dengan metode adsorpsi gas amonia (NH₃). Sintesis MIBK dari isopropanol dilakukan pada variasi temperatur, massa katalis, dan laju alir reaktan. Optimasi kondisi sintesis dilakukan menggunakan metode desain eksperimen Taguchi. Produk dianalisis menggunakan Kromatografi Gas-Spektrometri Massa (GC-MS).

Hasil analisis dengan *Atomic Absorption Spectroscopy* (AAS) menunjukkan bahwa pencucian dengan HCl 1,0 M mengurangi kandungan logam pengotor Na dan Ca sebesar 57,51% dan 16,30%, sedangkan kadar logam pengotor Fe mengalami penurunan yang sangat sedikit (< 1%). Hasil analisis keasaman dengan gas NH₃ menunjukkan terjadinya peningkatan nilai keasaman pada katalis Pt/KA dari 6,64 mmol.g⁻¹ (KA sebelum impregnasi) menjadi 7,43 mmol.g⁻¹. Hasil penelitian menunjukkan reaksi pada temperatur 450 °C, massa katalis 0,3 g, dan laju alir reaktan 0,9 mL.menit⁻¹ menghasilkan produk (MIBK) tertinggi yaitu sebesar 21,87%.

Kata kunci: isopropanol, karbon aktif, katalis heterogen, metil isobutil keton, platina.

SYNTHESIS OF METHYL ISOBUTYL KETONE FROM ISOPROPANOL OVER Pt/ACTIVATED CARBON CATALYST

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ABSTRACT

The study of isopropanol conversion into methyl isobutyl ketone (MIBK) using platinum/activated carbon (Pt/AC) catalyst had been carried out. This research was aimed to learn the effect of washing carbon with HCl on the metal impurities, the effect of Pt impregnation on catalyst acidity, and the optimum of temperature, catalyst mass, and isopropanol flow rate that can produce the most MIBK products.

The coconut shells were carbonized for 4 hours at a temperature of 600 °C. Physical activation of carbon was carried out by flowing CO₂ gas through sample at a temperature of 850 °C, while chemical activation was carried out by washing carbon with acetone and 1.0 M HCl. Platinum metal was dispersed in the pores of the activated carbon by wet impregnation. The Pt/AC catalyst was then reduced with H₂ gas flow at a temperature of 400 °C. The acidity of catalyst was determined using the ammonia gas (NH₃) adsorption method. The conversion of isopropanol into MIBK was carried out at variation of temperature, catalyst mass, and reactant flow rate. Optimization of the conversion conditions was carried out using the Taguchi experimental design method. The obtained products were analysed using Gas Chromatography-Mass Spectrometry (GC-MS).

The results of Atomic Absorption Spectroscopy (AAS) analysis showed that washing with 1.0 M HCl reduced the content of sodium (Na) and calcium (Ca) by 57.51% and 16.30%, while the Fe content decreased very slightly (< 1%). The results of acidity analysis using NH₃ gas showed an increase in acidity value of the Pt/AC catalyst from 6.64 mmol.g⁻¹ (AC before impregnation) to 7.43 mmol.g⁻¹. The conversion results showed that the reaction conditions at a temperature of 450 °C, a catalyst mass of 0.3 g, and a reactant flow rate of 0.9 mL.minute⁻¹ produced the highest MIBK that was 21.87%.

Keywords: activated carbon, heterogeneous catalyst, isopropanol, methyl isobutyl ketone, platinum.