



KONVERSI n-BUTANOL MENJADI 1,1-DIBUTOKSIBUTANA DENGAN KATALIS Fe/KARBON AKTIF

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INTISARI

Telah dilakukan penelitian konversi n-butanol menjadi 1,1-dibutoksibutana dengan katalis Fe/karbon aktif (KA). Penelitian ini dilakukan dengan membuat karbon aktif dari arang tempurung kelapa berukuran 40-60 mesh, kemudian diaktivasi pada suhu 850 °C selama 4 jam dan dialiri gas CO₂ dengan laju alir 10 mL/menit. Kemudian karbon aktif dicuci dengan aseton dan larutan HCl 1,0 M. Karbon aktif selanjutnya diimpregnasi dengan FeCl₃·6H₂O 2% dan direduksi selama 3 jam pada suhu 650 °C dengan dialiri gas H₂ dengan kecepatan alir 10 mL/menit. Kandungan logam Fe, Ca, dan Na dalam karbon aktif setiap proses pencucian ditentukan dengan AAS. Karakterisasi katalis dilakukan dengan menentukan keasaman karbon aktif dan katalis Fe/KA melalui metode gravimetri menggunakan adsorpsi amonia. Proses reaksi konversi n-butanol menjadi 1,1-dibutoksibutana dilakukan dalam tanur listrik dengan variasi suhu 500, 550, dan 600 °C, jumlah katalis 10, 15, dan 20 g, dengan aliran gas H₂ pada kecepatan alir 5, 10, dan 15 mL/menit. Variasi eksperimen dilakukan dengan metode Taguchi dan dihasilkan 9 variasi percobaan. Produk reaksi konversi dianalisis dengan FTIR, GC, GC-MS, ¹H-NMR, dan ¹³C-NMR.

Hasil analisis menunjukkan bahwa karbon aktif mengandung pengotor berupa logam Fe, Ca, dan Na. Pencucian karbon aktif dengan aseton dan larutan HCl dapat mengurangi kandungan logam Fe, Ca, dan Na pada karbon aktif. Keasaman karbon aktif meningkat setelah diimbangkan logam Fe, yaitu dari 6,49 mmol/g menjadi 10,09 mmol/g. Diperoleh hasil konversi n-butanol menjadi produk 1,1-dibutoksibutana menggunakan optimasi Taguchi sebesar 59,51% pada suhu 550 °C, massa katalis 15 g, dan laju alir gas H₂ 5 mL/menit.

Kata kunci: 1,1-dibutoksibutana, n-butanol, katalis Fe/KA, konversi



CONVERSION OF n-BUTANOL INTO 1,1-DIBUTOXYBUTANE BY Fe/ACTIVATED CARBON CATALYST

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ABSTRACT

Conversion of n-butanol into 1,1-dibutoxybutane by using Fe/activated carbon (AC) catalyst has been done. This research was conducted by preparing 40-60 mesh activated carbon from coconut shell charcoal, then activated it at 850 °C for 4 hours using CO₂ gas at flow rate of 10 mL/min. The activated carbon was then washed by acetone and HCl 1.0 M solution. Subsequently, the activated carbon was impregnated with 2% FeCl₃ and reduced for 3 hours at 650 °C using H₂ gas at flow rate of 10 mL/min. The contents of Fe, Ca and Na in the activated carbon were determined using Atomic Absorption Spectroscopy (AAS). Characterization of the catalyst was conducted to determine the acidity of activated carbon and catalyst Fe/AC by gravimetric method using ammonia adsorption. The process of conversion reaction of n-butanol into 1,1-dibutoxybutane was carried out in an electric furnace by varying the temperature of 500, 550, and 600 °C, the mass of catalyst 10, 15, and 20 g, and H₂ gas at flow rate of 5, 10, and 15 mL/min. Variations of experiments were conducted based on Taguchi method and produced nine variations of the experiment. Conversion reaction products were analyzed by FTIR, GC, GC-MS, ¹H-NMR and ¹³C-NMR.

The analysis showed that the activated carbon containing impurities such as Fe, Ca and Na metals. Washing activated carbon by acetone and HCl solution decreased the content of Fe, Ca, and Na metals significantly. Activated carbon acidity increased after Fe impregnation, from 6.490 mmol/g to 10.091 mmol/g. The highest conversion of n-butanol into 1,1-dibutoxybutane was 59.51%, based on Taguchi optimization at temperature of 550 °C, mass of catalyst 15 g, and H₂ gas flow rate of 5 mL/min.

Keywords: 1,1-dibutoxybutane, n-butanol, Fe/AC catalyst, conversion