KONVERSI *n*-BUTANOL MENJADI 1,1-DIBUTOKSIBUTANA MENGGUNAKAN KATALIS Zn/KARBON AKTIF (Zn/KA)

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INTISARI

Penelitian ini telah dilakukan dengan tujuan untuk membuat katalis Zn teremban pada karbon aktif (KA) yang memiliki keasaman tinggi, aktivitas katalitik dan selektivitas tinggi untuk menghasilkan 1,1-dibutoksibutana. Metode Taguchi digunakan untuk mengoptimasi parameter yang mempengaruhi reaksi seperti suhu, massa katalis, dan laju alir gas H_2.

Katalis dipreparasi dengan metode aktivasi karbon pada suhu 850 °C dengan aliran gas CO_2, kemudian dilakukan pencucian dengan aseton dan HCl 1,0 M. Impregnasi dilakukan dengan larutan garam prekursor $ZnCl_2$ kemudian direduksi pada suhu 650 °C dengan aliran gas H_2. Kadar logam pengotor Fe, Ca, dan Na dianalisis menggunakan *atomic absorption spectrometer* (AAS). Uji keasaman katalis dilakukan dengan metode adsorpsi ammonia. Konversi *n*-butanol fasa gas dilakukan dalam tanur listrik dengan variasi suhu (450; 550; 650 °C), massa katalis (10; 15; 20 g), dan laju alir gas H_2 (5; 10; 15 mL/menit). Produk dianalisis dengan *fourier transform-infrared* (FT-IR), *gas chromatography* (GC), *gas chromatography-mass spectrometer* (GC-MS), ^{1}H dan ^{13}C *nuclear magnetic resonance spectrometer* (NMR).

Hasil analisis menunjukkan bahwa pencucian dengan aseton dan HCl 1,0 M dapat mengurangi kadar logam pengotor dalam karbon. Hasil uji keasaman katalis menunjukkan bahwa katalis Zn/KA memiliki keasaman yang lebih tinggi dibandingkan dengan KA berturut-turut yaitu 8,807 dan 3,840 mmol/g. Senyawa 1,1-dibutoksibutana tertinggi yang dihasilkan adalah sebanyak 44,01% pada suhu 450 °C dengan massa katalis 15 g dan laju alir H_2 10 mL/menit. Kondisi optimum untuk dehidrasi *n*-butanol menggunakan metode Taguchi adalah pada suhu 550 °C dengan massa katalis 15 g dan laju alir 10 mL/menit.

Kata kunci: 1,1-dibutoksibutana, konversi katalitik, *n*-butanol, katalis Zn/KA, metode Taguchi.

CONVERSION OF *n*-BUTANOL TO 1,1-DIBUTOXYBUTANE USING Zn/ACTIVATED CARBON (Zn/AC) CATALYST

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ABSTRACT

This research was conducted to prepare Zn catalyst supported on activated carbon (AC) which has high acidity, high catalytic activity and selectivity to produce 1,1-dibutoxybutane. Taguchi method was used to optimize parameters affecting reaction such as temperature, the mass of catalyst and H_2 gas flow rate.

The catalyst was prepared through carbon activation method at 850 °C by CO_2 gas flow, washing process using acetone and 1,0 M HCl. Impregnation on activated carbon was done with $ZnCl_2$ solution, then reduced at 650 °C using H_2 gas flow. Metal impurities of Fe, Ca, and Na were measured using an atomic absorption spectrometer (AAS). The acidity catalyst test was performed by ammonia adsorption, and the acidity was obtained by the gravimetric method. *n*-Butanol conversion in the gas phase was carried out in an electric furnace with the variation of the temperature (450; 550; 650 °C), the mass of the catalyst (10; 15; 20 g), and H_2 gas flow rate (5; 10; 15 mL/min). The product was analyzed by fourier transform-infrared (FT-IR), gas chromatography (GC), gas chromatography-mass spectrometer (GC-MS), ^{1}H and ^{13}C nuclear magnetic resonance spectrometer (NMR).

Results of analyses showed that washing with acetone and 1,0 M HCl could reduce the amount of metal impurities in the activated carbon. The test results of acidity showed that catalyst acidity of Zn/AC has higher than AC, which was 8.807 and 3.840 mmol/g, respectively. The highest product of 1,1-dibutoxybutane was produced as much as 44.01% at 450 °C using the mass of the catalyst of 15 g and H_2 gas flow rate of 10 mL/min. The optimum condition for the dehydration of *n*-butanol using Taguchi method was at temperature 550 °C using the mass of the catalyst of 15 g and H_2 gas flow rate of 10 mL/min

Keyword: 1,1-dibutoxybutane, catalytic conversion, *n*-butanol, Zn/AC catalyst, Taguchi method.