SINTESIS, KARAKTERISASI, DAN APLIKASI KATALIS Ni/SILIKA (Ni/SiO_2) TERFOSFATASI UNTUK DEHIDRASI ETANOL MENJADI DIETIL ETER

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INTISARI

Sintesis, karakterisasi, dan aplikasi katalis Ni/Silika (Ni/SiO2) terfosfatasi untuk dehidrasi etanol menjadi dietil eter berhasil dilakukan. Tujuan dari penelitian ini mengkaji pengaruh keasaman katalis dan variasi temperatur kalsinasi katalis Ni/SiO_2 terfosfatasi berdimensi mesopori terhadap aktivitas dan selektivitas dehidrasi etanol menjadi dietil eter. Proses sintesis dilakukan dengan metode *sol-gel* dari prekursor TEOS sebagai sumber silika dan $NaHCO_3$ serta variasi asam fosfat 1, 2, dan 3 M. Katalis dikalsinasi pada variasi temperatur 400, 500, dan 600 °C. Katalis dengan keasaman tertinggi diimpregnasi dengan logam nikel 1, 2, dan 3% (b/b). Katalis dikarakterisasi menggunakan *Fourier Transform Infra-Red* (Shimadzu Prestige-21), alat- *X-Ray Diffraction* (Shimadzu model XRD-6000), *Scanning Elektron Microscopy-Elektron Dispersive Spectroscopy* (JEOL JSM-2300), dan *Atomic Absorption Spectrophotometer* seri Perkin Elmer PinAAcle 900T. Aplikasi katalis dengan keasaman tertinggi diuji aktivitas dan selektivitas pada reaksi dietil eter pada temperatur 175, 200, dan 225 °C. Produk yang diperoleh dianalisis menggunakan *Gas Chromatography* (GC) *spiking*.

Hasil karakterisasi menunjukkan sintesis material katalis Ni/Silika (Ni/SiO_2) terfosfatasi dengan temperatur optimum kalsinasi 400 °C, keasaman katalis 6,35 mmol/g. Struktur amorf untuk katalis.Ni/Silika (Ni/SiO_2), dengan kandungan 5,60% fosfat, dan 0,07 logam nikel. Katalis Ni/Silika (Ni/SiO2) memiliki temperatur optimum reaksi dehidrasi etanol pada 225 °C dengan hasil konversi 88% dan selektivitas sebesar 5,07% dietil eter.

Kata kunci: dehidrasi etanol, dietil eter, silika terfosfatasi, TEOS.

SYNTHESIS, CHARACTERIZATION, AND APPLICATION OF Ni/SILICA (Ni/SiO_2) PHOSPHTIZED FOR DEHYDRATION OF ETHANOL TO DIETHYL ETHER (DEE)

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ABSTRACT

Synthesis, characterization, and application of phosphated Ni/Silica (Ni/SiO2) catalyst for dehydration of ethanol to diethyl ether was successfully carried out. The aim of this study was to examine the effect of catalyst acidity and variations in calcination temperature of Ni/SiO catalysts$_2$ phosphatized mesoporous dimensions on the activity and selectivity of ethanol dehydration to diethyl ether. The synthesis process is carried out by the method sol-gel from the TEOS precursor as a source of silica and $NaHCO_3$ and variations of 1, 2, and 3 M phosphoric acid. The catalyst was calcined at various temperatures of 400, 500, and 600 °C. The catalyst with the highest acidity was impregnated with 1, 2, and 3% (w/w) nickel metal. The catalyst was characterized using*Fourier Transform Infra-Red* (Shimadzu Prestige-21), tools- *X-Ray Diffraction* (Shimadzu model XRD-6000), *Scanning Elektron Microscopy-Elektron Dispersive Spectroscopy* (JEOL JSM-2300), and *Atomic Absorption Spectrophotometer* Perkin Elmer PinAAcle 900T series. The application of the catalyst with the highest acidity was tested for activity and selectivity in the diethyl ether reaction at 175, 200 and 225 °C. The products obtained were analyzed using *Gas Chromatography* (GC) *spiking*.

The characterization results showed the synthesis of Ni/Silica (Ni/SiO_2) was phosphated with an optimum calcination temperature at 400 °C, catalyst acidity 6.35 mmol/g. Amorphous structure for the Ni/Silica (Ni/SiO_2) catalyst, containing 5.60% phosphate, and 0.07 nickel metal. The Ni/Silica (Ni/SiO2) catalyst has an optimum temperature for the ethanol dehydration reaction at 225 °C with a conversion yield of 88% and a selectivity of 5.07% diethyl ether.

Keywords: ethanol dehydration, diethyl ether, phosphated silica, TEOS.