

ABSTRACT

SYNTHESIS AND CHARACTERISATION OF $\text{Ni}_{0.6}\text{Cu}_{0.4}\text{Fe}_2\text{O}_4$ NANOCATALYST AND ITS ACTIVITY TEST FOR CO_2/H_2 CONVERSION

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In this study, nanocatalyst $\text{Ni}_{0.6}\text{Cu}_{0.4}\text{Fe}_2\text{O}_4$ has been prepared by sol-gel method using pectin as an emulsifying agent, and then the sample was subjected to calcination treatment at 600°C and 800°C. Its catalytic activity was tested for CO_2/H_2 conversion to alcohol at temperature of 200, 250, and 300°C. Analysis of the catalyst's acidity showed pyridine absorption at 0.68773 mmol/g catalyst at calcination temperature 600°C and 0.605125 mmol/g catalyst at calcination temperature 800°C. X-ray diffraction (XRD) and particle size analyzer (PSA) of catalyst showed that particle size is 16,02 nm with 60% size distribution at calcination temperature 600°C and 26,64 nm with 35% size distribution at calcination temperature 800°C. SEM - EDS analysis showed that there are elements of O, Fe, Ni, and Cu which indicates the formation of $\text{Ni}_{0.6}\text{Cu}_{0.4}\text{Fe}_2\text{O}_4$ compound. Analysis using gas chromatography showed that $\text{Ni}_{0.6}\text{Cu}_{0.4}\text{Fe}_2\text{O}_4$ catalyst with calcination temperature of 600°C and reaction temperature of 200°C and 300°C has the highest activity of the conversion CO_2/H_2 to ethanol at 0.1992% and 0.2752% yield.

Keyword: nanocatalysts, sol-gel method, conversion CO_2/H_2 , pectin, alcohol.

ABSTRAK

PEMBUATAN DAN KARAKTERISASI NANOKATALIS $\text{Ni}_{0,6}\text{Cu}_{0,4}\text{Fe}_2\text{O}_4$ SERTA UJI AKTIVITAS PADA KONVERSI ($\text{CO}_2 + \text{H}_2$)

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Telah dilakukan pembuatan nanokatalis $\text{Ni}_{0,6}\text{Cu}_{0,4}\text{Fe}_2\text{O}_4$ pada kalsinasi 600°C dan 800°C, dengan metode sol-gel menggunakan pengemulsi pektin, serta dilakukan uji aktivitas katalitik terhadap hasil konversi gas ($\text{CO}_2 + \text{H}_2$) menjadi alkohol pada suhu reaksi 200°C, 250°C, dan 300°C. Analisis keasaman katalis didapatkan penyerapan sebesar 0,68773 mmol piridin/g katalis pada kalsinasi 600°C dan 0,605125 mmol piridin/g katalis pada kalsinasi 800°C. Karakterisasi ukuran partikel (XRD) dan distribusi ukuran butiran (PSA) diproleh rata-rata ukuran partikel 16,02 nm dengan distribusi ukuran partikel 60% kalsinasi 600°C dan 26,64 nm dengan distribusi ukuran partikel 35% kalsinasi 800°C. SEM – EDS menyatakan bahwa terdapat unsur O, Fe, Ni, dan Cu yang menunjukkan terbentuknya senyawa $\text{Ni}_{0,6}\text{Cu}_{0,4}\text{Fe}_2\text{O}_4$. Analisis menggunakan kromatografi gas menyatakan bahwa katalis $\text{Ni}_{0,6}\text{Cu}_{0,4}\text{Fe}_2\text{O}_4$ pada suhu kalsinasi 600°C dengan suhu reaksi 200°C dan 300°C memiliki keaktifan tinggi terhadap konversi ($\text{CO}_2 + \text{H}_2$) menghasilkan etanol sebesar 0,1992% dan 0,2752%.

Kata kunci: nanokatalis, metode sol-gel, konversi ($\text{CO}_2 + \text{H}_2$), pektin, alkohol.