ABSTRACT

PREPARATION AND CHARACTERISATION OF $Ni_{0,6}Fe_2Co_{0,4}O_4$ NANOCATALYST FOR REACTION HYDROGENATION CATALYTIC OF CO_2

By

Sanjaya Yudha Gautama

In this study, nano catalyst $Ni_{0,6}Fe_2Co_{0,4}O_4$ has been prepared by sol gel – freeze dry method using pectin as an emulsifying agent, and then the sample was subjected to calcination treatment and subsequently characterized using the techniques of X-ray diffraction (XRD), Rietveld and Scherrer Methods, FTIR, PSA and SEM analysis. Its catalytic activity was tested for CO_2/H_2 conversion to alcohol at a temperature of 200 - 400°C. The results of XRD characterization indicated that $Ni_{0,6}Fe_2Co_{0,4}O_4$ calcined at 600°C materials consist of three crystalline phases which are Fe_2NiO_4(25.3%), Fe_3O_4 (51.5%), and $CoFe_2O_4$ (23.2%). The results of size analysis using both Scherrer method and SEM show that the size of the catalyst is in the range of 11,8 – 22,0 nm. Then, particle size analyzer (PSA) proved that particle size distribution is in the range of 0-2%. Catalytic activity tests showed that $Ni_{0,6}Fe_2Co_{0,4}O_4$ nanocatalysts are active. Product analysis using gas chromatography indicates that the $Ni_{0,6}Fe_2Co_{0,4}O_4$ nanocatalyst calcined at 600°C is the most active for conversion of CO_2/H_2 at a reaction temperature of 200 °C and propanol yield is 53134.83 ppm.

Keywords; nano catalysts, pectin, , sol gel – freeze dry, alcohol

ABSTRAK

PREPARASI DAN KARAKTERISASI NANOKATALIS $Ni_{0,6}Fe_2Co_{0,4}O_4$ UNTUK REAKSI HIDROGENASI KATALITIK CO_2

Oleh

Sanjaya Yudha Gautama

Pada penelitian ini telah dibuat nanokatalis $Ni_{0,6}Fe_2Co_{0,4}O_4$ dengan metode *sol-gel* dan *freezedry* menggunakan pektin, serta dilakukan uji aktivitas katalitiknya terhadap reaksi konversi (CO_2/H_2) menjadi alkohol pada suhu 200 – 400°C. Hasil karakterisasi katalis setelah kalsinasi 600 °C menunjukan terbentuknya 3 fasa kristalin yaitu Fe_2NiO_4 (25,3%), Fe_3O_4 (51,5%), dan $CoFe_2O_4$ (23,2%). Hasil analisis ukuran XRD menggunakan persamaan *Scherrer* dan analisis menggunakan SEM menunjukan ukuran katalis pada rentang 118 - 220 nm. Hasil analisis ukuran distribusi partikel menggunakan PSA menghasilkan katalis berskala nanometer pada rentang 0 - 2 %. Hasil uji aktivitas katalitik menunjukkan bahwa katalis $Ni_{0,6}Fe_2Co_{0,4}O_4$ aktif dan memiliki selektifitas yang tinggi. Analisis menggunakan kromatografi gas menunjukkan bahwa katalis $Ni_{0,6}Fe_2Co_{0,4}O_4$ pada suhu kalsinasi 600°C dengan suhu reaksi 200 °C paling aktif terhadap konversi CO_2/H_2 menghasilkan propanol yaitu 53134,83 ppm.

Kata kunci ; nanokatalis, pektin, PSA, *Scherrer, solgel-freezedry,* SEM