

ABSTRAK

Telah dilakukan sintesis γ -alumina mesopori dari lumpur lapindo dengan tujuan untuk mengetahui adanya pengaruh perbandingan mol Al/CTAB terhadap karakteristik dan kemampuan adsorpsi pada zat warna *congo red*. Penelitian ini dilakukan dengan beberapa tahapan, ekstraksi Al_2O_3 dari lumpur lapindo dengan metode refluks, sintesis γ - Al_2O_3 mesopori menggunakan metode sol-gel dengan adanya variasi rasio mol Al/CTAB (0,05; 0,1; 0,15; dan 0,2 mol), dan dilakukan aplikasi γ - Al_2O_3 mesopori sebagai adsorben zat warna *congo red*. Hasil ekstraksi Al_2O_3 dari lumpur lapindo dikarakterisasi dengan menggunakan *X-Ray Fluorescence* (XRF), hasil sintesis γ - Al_2O_3 mesopori dikarakterisasi dengan *X-Ray Diffraction* (XRD), *Gas Sorption Analyzer* (GSA) dan *Fourier Transform Infra Red* (FTIR) serta dilakukan uji keasaman. Berdasarkan hasil penelitian dan karakterisasi yang dilakukan, diperoleh persentase kandungan Al_2O_3 sebesar 69,97%. Analisis XRD dan FTIR menghasilkan kerangka γ - Al_2O_3 mesopori yang serupa dengan fasa amorf pada semua variasi dan mengarah pada struktur γ - Al_2O_3 . Hasil GSA menunjukkan hasil yang berbeda-beda pada setiap sampel dengan luas permukaan dan diameter pori terbesar, secara berturut-turut $367,722 \text{ m}^2.\text{g}^{-1}$ dan $6,910 \text{ cm}^3.\text{g}^{-1}$, dan hasil uji keasaman tertinggi yaitu $3,855 \text{ mmol}.\text{g}^{-1}$ oleh γ - Al_2O_3 mesopori variasi 0,2 mol. Hasil kondisi optimum pada proses adsorpsi *congo red* oleh γ - Al_2O_3 mesopori yaitu selama 15 menit dengan kapasitas adsorpsi sebesar $1,074 \text{ mg}.\text{g}^{-1}$ dengan model kinetika adsorpsi *congo red* oleh γ - Al_2O_3 mesopori mengikuti model kinetika pseudo orde 2 dan konstanta laju reaksi $1,5056 \text{ g}.\text{mg}^{-1}.\text{menit}^{-1}$.

Kata kunci: γ - Al_2O_3 mesopori, lumpur lapindo, CTAB, sol-gel, adsorpsi, *congo red*

ABSTRACT

The synthesis of mesoporous γ -alumina from lapindo mud has been carried out to determine the effect of the mole ratio of Al/CTAB on the characteristics and adsorption ability of congo red dye. This research was conducted in several stages, the extraction of Al_2O_3 from lapindo mud by reflux method, the synthesis of mesoporous γ - Al_2O_3 using sol-gel method with the variation of mole ratio of Al/CTAB (0.05; 0.1; 0.15; and 0.2 mol), and the application of mesoporous γ - Al_2O_3 as adsorbent of congo red dye. The results of γ - Al_2O_3 extraction from Lapindo mud were characterized using X-ray fluorescence (XRF), the results of mesoporous γ - Al_2O_3 synthesis were characterized by X-ray diffraction (XRD), Gas Sorption Analyzer (GSA) and Fourier Transform Infra-Red (FTIR) and acidity test. Based on the results of the research and characterization carried out, the percentage of Al_2O_3 content is 69.97%. XRD and FTIR analysis produced a mesoporous γ - Al_2O_3 framework similar to the amorphous phase in all variations and led to the γ - Al_2O_3 structure. GSA results showed different results in sample with the largest surface area and pore diameter, respectively $367.722 \text{ m}^2.\text{g}^{-1}$ and $6.910 \text{ cm}^3.\text{g}^{-1}$ and the highest acidity test result was $3.855 \text{ mmol}.\text{g}^{-1}$ by 0.2 mol variation of mesoporous γ - Al_2O_3 . The optimum conditions for the adsorption of congo red by mesoporous γ - Al_2O_3 were 15 min with an adsorption capacity of $1.074 \text{ mg}.\text{g}^{-1}$ with the kinetics model of congo red adsorption by mesoporous γ - Al_2O_3 following a pseudo-second-order kinetics model and a reaction rate constant of $1.5056 \text{ g}.\text{mg}^{-1}.\text{min}^{-1}$.

Keywords: Mesoporous γ - Al_2O_3 , lapindo mud, CTAB, sol-gel, adsorption, congo red