

ABSTRAK

Telah dilakukan penelitian sintesis alumina mesopori (AM) dari lumpur lapindo dengan metode sol gel variasi waktu sonikasi dan aplikasi untuk adsorpsi *congo red*. Penelitian ini terdapat beberapa tahapan yaitu ekstraksi alumina dari lumpur lapindo dengan metode refluks, sintesis AM dengan metode sol gel variasi waktu sonikasi menggunakan template *Cetyltrimethylammonium Bromide* (CTAB), dan adsorpsi *congo red* dengan menggunakan adsorben AM. Variasi waktu sonikasi yang digunakan adalah 0, 1, 2, 3, dan 4 jam yang secara berturut-turut akan menghasilkan sampel AM-0, AM-1, AM-2, AM-3, dan AM-4. Hasil ekstraksi alumina dari lumpur lapindo dikarakterisasi *X-Ray Fluorescence* (XRF). Hasil sintesis AM dianalisis *Fourier Transform InfraRed* (FTIR), *X-Ray Diffraction* (XRD), *Gas Sorption Analyzer* (GSA), dan uji keasaman. Berdasarkan penelitian yang dilakukan, hasil ekstraksi dari lumpur lapindo mengandung Al_2O_3 sebanyak 69,97%. Berdasarkan data FTIR dan XRD, seluruh variasi sampel AM mengarah pada struktur $\gamma\text{-Al}_2\text{O}_3$. Sampel AM-4 menunjukkan sampel terbaik yang mempunyai luas permukaan spesifik sebesar $270,008 \text{ m}^2\text{g}^{-1}$, volume pori $0,514 \text{ cm}^3\text{g}^{-1}$, diameter pori 3,272 nm, nilai keasaman $2,253 \text{ mmol.g}^{-1}$, dan memiliki kapasitas adsorpsi terbesar sebanyak $1,358 \text{ mg.g}^{-1}$ dengan waktu kontak optimum selama 60 menit. Adsorpsi *congo red* dengan AM sebagai adsorben mengarah pada model kinetika pseudo dengan orde kedua dengan nilai konstanta laju reaksi orde 2 sebesar $0,236 \text{ g.mg}^{-1}\text{menit}^{-1}$.

Kata kunci: Alumina mesopori, lumpur lapindo, *congo red*, adsorpsi, sonikasi

ABSTRACT

The synthesis of mesoporous alumina (AM) from Lapindo mud by sol gel method with sonication time variation and application for congo red adsorption have been conducted. This research has several stages, extraction of alumina from Lapindo mud by reflux method, synthesis of AM by sol gel method with sonication time variation using Cetyltrimethylammonium Bromide (CTAB) template, and adsorption of congo red using AM. The sonication time variations used are 0, 1, 2, 3, and 4 hours which will produce AM-0, AM-1, AM-2, AM-3, and AM-4 samples, respectively. The results of alumina extraction from Lapindo mud were characterized by X-Ray Fluorescence (XRF). AM synthesis results were analyzed by Fourier Transform InfraRed (FTIR), X-Ray Diffraction (XRD), Gas Sorption Analyzer (GSA), and acidity test. Based on the research conducted, the extraction results from Lapindo mud contain Al_2O_3 as much as 69.97%. Based on FTIR and XRD data, all AM sample variations lead to the γ - Al_2O_3 structure. Sample AM-4 shows the best sample with a specific surface area of $270.008\ m^2\ g^{-1}$, pore volume of $0.514\ cm^3\ g^{-1}$, pore diameter of 3.272 nm, acidity value of $2.253\ mmol\ g^{-1}$, and has the largest adsorption capacity of $1.358\ mg\ g^{-1}$ with an optimum contact time of 60 minutes. The adsorption of congo red with AM as adsorbent leads to a second-order pseudo kinetics model with a second-order reaction rate constant value of $0.236\ g\cdot mg^{-1}\cdot min^{-1}$.

Keywords: Mesoporous alumina, lapindo mud, congo red, adsorption, sonication