

ABSTRACT

Lapindo mud has a high alumina content, making it a potential source of aluminum and research material, including the development of mesoporous alumina. Mesoporous alumina is a porous material with a size of 2–50 nm that is widely used as a catalyst and adsorbent. Its synthesis generally uses CTAB as a structure-directing agent to regulate the pores, and stearic acid to increase thermal stability and mechanical strength. This study aims to synthesize and determine the character of mesoporous alumina from Lapindo mud with variations in the ratio of stearic acid/CTAB/Al templates using the sonication method and to determine the adsorption capacity and adsorption kinetics of the synthesized mesoporous alumina as Rhodamine B adsorbent. The research process begins with the extraction of Al_2O_3 from Lapindo mud, the synthesis of mesoporous alumina with the help of CTAB and stearic acid templates using the sonication method, then the adsorption of Rhodamine B at various contact times. The results of the mesoporous Al_2O_3 synthesis will then be analyzed using FTIR, XRD, GSA, and acidity tests. The results showed that the percentage of Al_2O_3 from Lapindo mud extraction was 80.95%. The characterization results using XRD and FTIR indicated the formation of the $\gamma\text{-Al}_2\text{O}_3$ phase. The GSA results showed a maximum pore diameter of 22.50 nm, the highest pore volume of $0.14 \text{ cm}^3 \cdot \text{g}^{-1}$, and the largest surface area reached $56.66 \text{ m}^2 \cdot \text{g}^{-1}$. In addition, the highest acidity value obtained was $15.26 \text{ mmol} \cdot \text{g}^{-1}$. The optimum condition was obtained when mesoporous Al_2O_3 adsorbed Rhodamine B for 40 minutes with an adsorption capacity of $5.14 \text{ mg} \cdot \text{g}^{-1}$, and followed a pseudo-first-order kinetic model with a reaction rate constant of $4 \times 10^{-3} \text{ g} \cdot \text{mg}^{-1} \cdot \text{min}^{-1}$ and adsorption kinetics of $23.38 \text{ mg} \cdot \text{g}^{-1}$.

Keywords: mesoporous Al_2O_3 , adsorption, Rhodamine B