

ABSTRACT

ZrO₂ nanoparticles are produced through an extraction process from zircon sand using caustic fusion method, synthesis of nanoparticles using precipitate method and ended with calcination with temperature variations, namely 500⁰C, 600⁰C, and 700⁰C. ZrO₂ was then characterized using X-Ray Diffraction (XRD) and Surface Area Meter using the Brunauer-Emmett-Teller (BET) method. The results showed that the ZrO₂ nanoparticles with a calcination temperature of 600⁰C had a tetragonal structure with the highest intensity value of $2\theta = 30.383^\circ$ which was 6492 and had FWHM value of 0.612. The calculation of crystal size is done using Debye Scherrer equation of 16.6 nm and has surface area of 139.006 m²/g from the characterization results using BET method and has a particle size of 7.1 nm. The use of ZrO₂ nanoparticles as an adsorbent of methylene blue and ZrO₂ with calcination temperature of 600⁰C has better absorption ability than others. From the analysis of the isotherm model, ZrO₂ nanoparticles are more suitable for the Freundlich adsorption isotherm with relation coefficient (R^2) of 0.92. The absorption of methylene blue volume of 10 ml had the largest reaction rate constant value of 0.89919 following the 2nd order adsorption kinetics model.

Keywords: *Zircon sand, zirconia, synthesis, calcination, adsorbent*