## **ABSTRACT**

Zirconium silicate (ZrSiO<sub>4</sub>) testing as an adsorbent is carried out by varying the activation temperature, stirring time and variations in methylene blue concentration. The adsorption process is carried out by dissolving a sample of zirconium silicate (ZrSiO<sub>4</sub>) that has been activated into a solution of methylene blue dye and stirred using a magnetic stirrer at a certain speed which is then measured adsorbantion value using a UV-VIS spectrophotometer. From the research that has been carried out, the surface area of zirconium silicate (ZrSiO<sub>4</sub>) is 10,365 m<sup>2</sup>/g, with a particle size (D) of 126,945 nm. Zirconium silica (ZrSiO<sub>4</sub>) has a tetragonal crystal structure with crystal sizes for temperatures of 700°C, 600°C, and 500°C respectively of 50.9369 nm, 47.5481 nm, and 52.8192 nm. Based on the correlation value (R<sup>2</sup>) of adsorption isotherm analysis, it is concluded that Langmuir isotherms are closer to experimental data compared to Freundlich isotherms with a correlation value (R<sup>2</sup>) of 0.8176 which indicates that the adsorption process is dominated by monolayer absorption, with a maximum adsorption capacity (q<sub>m</sub>) value of 19.763 mg/g. The adsorption kinetics that occur follow the 2<sup>nd</sup>-order kinetic model with a correlation value (R<sup>2</sup>) closest to 1 and the largest reaction rate constant (k<sub>2</sub>) of 0.6668 min<sup>-1</sup> which occurs at a concentration of 5ppm.

Keywords: activation, zirconium silica (ZrSiO4), adsorption, XRD, Surface Area Meter