

## **Improving ammonium sorption of Bayah natural zeolites by hydrothermal method**

### **ABSTRACT**

Natural zeolites are easily found and abundant in Indonesia. The natural zeolites are low-cost minerals; however, their ammonium sorption is poor. A hydrothermal method was applied to improve the ammonium sorption. Hydrothermal treatment times were varied 8, 24, and 32 h. The parent and hydrothermal treated samples were characterized by using X-ray diffraction (XRD), Field Emission Scanning Electron Microscopes (FE-SEM), Fourier-transform infrared spectroscopy (FTIR), and nitrogen physisorption. Ammonium adsorption was performed using a batch reactor to evaluate the adsorption performance of the prepared zeolite samples. The 8 h hydrothermal (HT 8 h) treated zeolites showed the highest ammonium removal percentage among others. The XRD analysis of HT 8 h shows a higher crystallinity of mordenite and the Brunauer–Emmett–Teller (BET) model shows a surface area of 105 m<sup>2</sup> /g, much larger as compared to the parent with a surface area of 19 m<sup>2</sup> /g. Various kinetic and isotherms models were also studied on the parent and HT 8 h samples. The intraparticle equation showed the most accurate model for the kinetic data and the Freundlich equation showed the most accurate model for the isotherm of the experimental data. In terms of ammonium removal efficiency, hydrothermally treated Bayah mordenite compares favorably with treated mordenite from other locations despite that clinoptilolite provides higher removal capacities than mordenite.