ABSTRACT

Fly ash is a fine - size particle, containing many unburned residuals. Each year about 10 million tons of fly ash are generated; most of the waste fly ashes were disposed as solid waste in landfill. Some were used as cement-like material, fill material or pavement materials. Since the main components of fly ash are SiO_2 and Al_2O_3, which exhibit a similar chemical structure of zeolite, this study is concentrated on the used fly ash as raw materials for synthesizing zeolite.

The objective of this study was to determine the maximum condition on fly ash synthesis, which would conciliate a high cation exchange capacity (CEC) of synthesized zeolite. To achieve this goal, the strategy relied on the use of experimental design methodology. The effects of five parameters including sieve size, activated temperature, NaOH concentration, reaction temperature, and reaction time were determined by using the two factorial design approach to specify the significant parameters on the formation of zeolite from fly ash. In the first step, the reaction temperature was found to be the most important parameter and two other significant parameters are activated temperature and reaction time.The second step of this studied, the three significant parameters were controlled at the various values and the cation exchange capacity (CEC) were determined for maximum condition. Reaction temperature, activated temperature, and reaction time were in the range of 40 to 150 $^{\circ}C$, 800 to 1100 $^{\circ}C$ and 12 to 96 hours, respectively. The results showed that the maximum condition, which exhibited the highest CEC

(635 mmol/kg) of synthesized zeolite at reaction temperature of 110 ^{o}C, activated temperature of 800 ^{o}C, and reaction time of 96 hours.

Removal of Cadmium by using zeolite-like material at the optimum condition was evaluated with batch adsorption test. The cadmium sorption data were well expressed by the Freundlich isotherm than Langmuir isotherm. The maximum adsorption capacity was 234 mg. Cd/g Zeolite. Continuous adsorption tests using column of pellet zeolite-like material were performed to study the effect of initial concentration and hydraulic loading rate(HLR) on cadmium removal. The adsorption capacity of 2 mg/l Cd initial concentration were found to be 0.2 and 0.15 mg Cd/g pellet zeolite-like material for 0.22 and 0.44 l/cm^2/hr, respectively. Moreover, adsorption capacity of 10 mg/l Cd initial concentration were found to be 0.79 and 0.44 mg Cd/g pellet zeolite-like material for 0.22 and 0.44 l/cm^2/hr respectively.