ABSTRACT

Synthetic zeolite is made at low hydrothermal temperatures. Parameters or several factors such as temperature, time, pH, Si/Al ratio, will influence the structure, crystallinity, application capabilities, or the type of zeolite produced. Many of these factors can be simplified through response surface methodology (RSM) which is used to determine the best combination of factors to provide the most desired response. Zeolite synthesis was carried out with variations in heating temperature (70, 85, 100) ˚C, heating time (5, 7, 9) hours and Si/Al ratio (1, 2, 3). The synthesized zeolite was then characterized by XRD to determine the percent crystallinity. The results of the RSM zeolite synthesis were then used as an adsorbent for crystal violet (CV) adsorption. The results obtained were synthetic zeolite in RSM condition with the highest crystallinity of 94.06% (Z-14) and the lowest of 25.4% (Z-11) with the highest % CV removal of 76.5% (Z-11) and the lowest 49.06% (Z-14). RSM optimization for the response of % zeolite crystallinity and % CV removal resulted in the best combination of synthesis conditions, namely heating temperature 86.06˚C, heating time 8.67 hours and Si/Al ratio 1.5. This combination of factors produced the best response, % crystallinity of 97.19% and % CV removal of 53.16%. Based on the resulting adsorption kinetics data, the pseudo-second order kinetic model is more appropriate to describe the CV dye adsorption process by the optimized zeolite. Also obtained was a k_2 value of 0.034 g $mmol^{-1}$ min^{-1}.

Keywords: Zeolite, RSM, Crystallinity, Adsorption, Crystal violet