Adsorption Study of Nitrate Anions by Different Materials Using Fixed Bed Column

Abstract- MCM-41 is a mesoporous material with a hexagonal structure, has a high surface area, high pore vol., and low mass density. Continuous adsorption fixed bed of NH$_2$-MCM-41 adsorbent was utilized for the removal of nitrate anions from aqueous solutions. The effect of adsorbent weight (0.5, 1, 2 gm), flow rate (0.5, 1.0, 1.5 ml/min) and initial NO$_3^-$ concentrations (50, 75, 100 mg/l) on breakthrough curves were studied. It was found that breakthrough time increases with increasing column bed height and decreases with increasing NO$_3^-$ inlet concentration and flow rate. The highest removal percentage (75.2%) achieved at inlet concentration of 100 mg/L of NO$_3^-$ anion, 1gm adsorbent weight and 1.5 ml/min flow rate. Thomas and Yan adsorption models showed a good fit to the experimental data. Removal of nitrate anion by traditional activated carbon was also investigated and the results were compared with the nitrate removal by NH$_2$-MCM-41. It was concluded that NH$_2$-MCM-41 is more efficient in nitrate removal than activated carbon and the maximum removal percentage of nitrate anions by traditional activated carbon was found to be 55.8%.

Keywords- fixed bed, nitrate anion, NH$_2$-MCM-4.