DESALINATION ABILITY OF MURUNKAN CLAY – A LABORATORY SIMULATED STUDY

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Availability of portable water is becoming a problem. It is estimated that in the next 20 years the average per capita supply of clean water will decrease by one third. Desalination is one option for producing portable water from saline water, but most currently used water desalination technologies such as reverse osmosis, electro dialysis and distillation are energy and capital intensive. Natural clay found in Murunkan area in Sri Lanka has shown good cation removal capacity. The main objective of this study is to evaluate the ion removal capacity of Murunkan clay for desalination applications. Removal of Na^+, K^+, Mg^{2+} and Ca^{2+} cations from saline water was investigated.

Murunkan clay sample was ground, sieved through a 1 mm sieve and 10 g of it was packed well in a 10 cm^3 syringe within 2 glass wool barriers. 0.200 mol dm^{-3} NaCl solution was passed through it using a peristaltic pump and elluent was collected in 10 min time intervals and column saturation time was estimated by considering percentage removal of Na^+ ions in each time period and analyzing it using Atomic Absorption Spectrophotometer. The same procedure was done using 0.100 mol dm^{-3} KCl solution and 0.100 mol dm^{-3} $CaCl_2$ solution. The estimated column saturation time was 60 min for K^+ ion and Na^+ ions and that of 80 min for Ca^{2+} ions.

Lagoon water sample collected from Jaffna lagoon was passed through 10 g of Murunkan clay sample and amount of cations Na^+, K^+, Mg^{2+} and Ca^{2+} present in the elluent was estimated and percent removal of each cation by Murunkan clay was calculated. The elluent was passed through another Murunkan clay column and the same procedure was repeated. The same experiments were repeated using acid treated Murunkan clay sample. Better results were obtained with acid treated Murunkan clay. The initial concentrations of Na^+, K^+, Ca^{2+} and Mg^{2+} in lagoon water sample was found to be 20 400, 608, 500, 3 070 ppm respectively. After passing the lagoon water sample through two acid treated columns concentrations of Na^+, K^+, Ca^{2+} and Mg^{2+} in elluent were reduced to 2 940, 459, 46, 1 985 ppm respectively. The percentage removal of Na^+, K^+, Ca^{2+} and Mg^{2+} ions by repeated filtration through acid treated Murunkan clay was observed with removal of 85%, 24%, 91% and 35% respectively. It was observed that 667 g of acid treated Murunkan clay and 1000 g of raw Murunkan clay was required to desalinate 1 litre of lagoon water.

The percentage removal of Na^+, K^+ and Ca^{2+} ions from 500, 600,700, 800, 900 and 1000 mg dm^{-3} solutions of above cations by raw Murunkan clay was observed by passing each of the solutions through 10 g Murunkan clay sample. Langmuir, Freundlich and Temkin isotherms were constructed to find the mechanism of ion removal capability in Murunkan clay. The Na^+ ion removal data by Murunkan clay fit well with Langmuir, Freundlich and Temkin adsorption isotherms. Two steps in adsorption process were observed in the adsorption of K^+ ions on Murunkan clay. The adsorption of Ca^{2+} ions on Murunkan clay obeys Langmuir, Freundlich and Temkin adsorption isotherms