

Treatment of Reverse Osmosis (RO) Reject Water Using Modified Adsorbent from Drinking Water Treatment Sludge

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Both, reject water of Reverse osmosis (RO) plants and alum sludge of drinking water treatments cause a challenging threat to the environment. Accordingly, in this study alum sludge in drinking water treatment was used to modify an improved adsorbent material to absorb fluoride, chloride, bromide, nitrate, and sulphate ions in the RO reject water. In addition, one-month and two-month-old separate samples from each sludge lagoon in the Kandy-South water treatment plant were obtained in chronological order to investigate the impact of exposure time of sunlight in drying effects on the adsorption ability. Furthermore, the sludge samples were oven-dried and pyrolyzed for 300 °C, 400 °C, 500 °C, 700 °C, 800 °C, and 900 °C temperatures. Initially characterized RO reject water was allowed to come in contact with the modified adsorbent material for the ion removal experiment. Above mentioned ion concentrations were analyzed in the filtrate solution. The adsorption experiments were carried out by varying contact time (20-90 hours) and adsorbent dosage (0.1-5 g). Ion Chromatograph (Eco IC, and Metrohm) for analyzing ion concentrations in filtrates and the scanning electron microscope (SEM) for the characterization of the developed adsorbents before and after physical activity were used. The analyzed results showed that the fluoride removal could achieve up to 55% while 1% removal of Nitrate and Sulphate in one-month-old and two-month-old oven-dried adsorbent material. Accordingly, there was no effect on the time factor for oven-dried material. Finally, it could be concluded that the adsorption ability of oven-dried material for fluoride ions is prominent. Further, it can suggest that this is an easy and environment-friendly method to treat the RO reject water.

Keywords: RO reject, Sludge, Oven-dried, Environment