FLUORIDE ION ADSORPTION ON ARECA CATECHU (BETELNUT PALM) NUT HUSK ACTIVATED CARBON

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Groundwater seems to be the most significant natural source of potable water for millions of individuals. Fluoride ion pollution in groundwater is a major problem in Sri Lanka's dry zone areas. Groundwater, particularly in tropical regions such as Sri Lanka, is a significant source of fluoride ion exposure. In Sri Lanka, well water from the Eppawala and Anuradhapura regions has been evidenced to contain the highest concentrations of fluoride ion. Fluoride ion is a useful ion for human health and fluoride-related health problems can occur due to deficiency or excess intake. Excess amounts of fluoride cause many diseases: dental fluorosis, skeletal fluorosis, arthritis, bone damage, osteoporosis, muscular damage, etc. The acceptable fluoride ion concentration in drinking water according to the Sri Lanka Standard (SLS) is 1.0 mg/dm^3 (ppm). This study explores the potential of activated carbon derived from Areca *catechu* nut husks as a material for removing fluoride from water. The activated carbon was produced using a chemical activation process with potassium hydroxide at 500 $^{\circ}$ C under a nitrogen atmosphere. Batch adsorption experiments were conducted to evaluate the influence of contact time, adsorbent dosage, initial fluoride ion concentration, activation temperature, activation time, potassium hydroxide ratio, and stirring time on fluoride ion removal efficiency. The percentage removal of fluoride ion by the adsorbent was ~90% at a contact time of 30 minutes. The maximum fluoride ion adsorption was observed at 2 ppm of fluoride solution with an adsorbent dose of 40 gm/L, activation time 1 hour, char: KOH ratio 1:3, and stirring time 3 hours. The adsorption equilibrium data was analyzed using the Langmuir and Freundlich isotherm models. The Langmuir model fits the experimental data better than the Freundlich model. The adsorption capacity of the Areca catechu nut husk-activated carbon composite was found to be 3.5334 mg/g. The composite adsorbent prepared from Areca *catechu* nut husk activated carbon could be an efficient adsorbent for the removal of fluoride ion from water.

Key words: Adsorption, Fluoride, KOH/ Areca catechu nut husk carbon composite.