

Applicability of Using Rice Husk for Fluoride Removal from Drinking Water in Anuradhapura, Sri Lanka

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Finding low cost, environmentally friendly adsorbents with having higher removal efficiencies are vital to improve the quality of drinking water in the regions where groundwater is contaminated with fluorides. In Sri Lanka, this problem is apparent and has been prevailing especially in the north-central province. Rice husk is claimed to have better fluoride removal when used as an adsorbent. As a country known for its paddy cultivation, the waste material of it, the rice husk would be cheaper if can be used as a filter material. Therefore, this study was sought at investigating the efficiency of rice husk as a filter material in removing fluoride from groundwater. For that, bio-waste rice husk was converted to activated carbon by thermal activation and through merely treating with H_3PO_4 . Characterization of Rice Husk Activated Carbon (RHAC) was carried out using the following methods: Fourier Transform Infra-Red (FT-IR), physical properties such as moisture content, ash content, and bulk density were also determined. FT-IR analysis showed the presence of various functional groups such as $C=O$, $C=C$, $-OH$, and $C-H$ on the surface of the adsorbent. Moisture content, ash content and bulk density were found to be $5.32 \pm 0.06 \%$, $15.28 \pm 0.22\%$, $535 \pm 0.51 \text{ kg m}^{-3}$ respectively. The effect of contact time and initial concentration were studied. Fluoride equilibrium time was found to be 120 minutes. Adsorption of Fluoride fits the Langmuir isotherm. Fluoride adsorption experiments were performed on the laboratory-scale column. The parameters obtained from the laboratory scale column were used to build the packed bed column using a scale-up approach. 10.0 g of RHAC has the capacity of attaining 83% of fluoride removal for the initial concentration of 10 mg L^{-1} .

Keywords: Rice husk activated carbon, Fluoride, Langmuir isotherm, Packed bed column