

Removal of fluoride and hardness from natural water using KOH activated carbon

Sewwandi G.A.S.¹, Rathnapala A.A.A.W.K.², Perera A.D.L.C.^{1*}

¹*Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka*

²*Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka*

Prolonged intake of drinking water having excess fluoride and hardness can cause adverse health effects such as fluorosis, cancer, arthritis, and kidney diseases. In the present study, potential of KOH activated carbon (KOH-AC) derived from coconut coir dust, was evaluated for removal of excess fluoride and hardness in natural water in batch process. Clean dry coconut coir (30.0 g) was treated with KOH, pyrolysed at 450 °C under nitrogen atmosphere. The KOH-AC (yield-31%) has a MB number of 392.74 mg g⁻¹, iodine value of 590.29 mg g⁻¹, surface area of 100.285 m² g⁻¹ and pH_{PZC} of 6.58. The PXRD confirms the existence of graphitic amorphous structure, while FT-IR spectrum revealed that the functional groups present in raw coir retained in KOH-AC. Experiments were carried out with a standard NaF solution (3.0 ppm) and natural hard water (total hardness = 400 ppm) to optimize adsorbent dose, contact time and pH of adsorbate for maximum removal of fluoride and hardness, respectively. All experiments were triplicate. The highest fluoride removal of 79% was achieved from 3.0 ppm NaF solution with 8 g L⁻¹ of KOH-AC and 30 min contact time at a pH of 2. The highest total hardness removal of 90 % from above natural water was achieved using 2 g L⁻¹ of KOH-AC and 60 min contact time at higher pH values (8-10). When natural hard water samples (total hardness > 300 ppm) collected from 6 sites were treated with KOH-AC, total hardness was reduced by 50% and fluoride by 27%.

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*Corresponding author: chandanip@pdn.ac.lk