Designing a cost-effective and dual-functional muslin-based anion exchanger for defluoridation

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\textbf{ABSTRACT}

In the present study, muslin was modified by graft copolymerization with poly(4-vinyl pyridine) using $\gamma$-ray initiation method. The graft copolymers, thus synthesized, were further functionalized by reaction with 2-chloroethanol. The resultant materials, having pyridinium ring and exchangeable Cl$^-$, were evaluated for the removal of fluoride ions from the simulated water samples. The materials exhibited high fluoride uptake and the maximum uptake was observed at pH 4.0, 20°C and 10 ppm of the fluoride ions. The maximum retention capacity of 7.7 mg/g was observed when fluoride uptake was studied up to 10 cycles. The data generated fit the pseudo-second-order kinetics and Langmuir isotherm. The efficacy of the functionalized muslin was evaluated as an antimicrobial agent against a bacterium (\textit{Bacillus aureus}) and a fungus (\textit{Aspergillus niger}). It was observed to be effective to inhibit the growth of both the microbes.

\textbf{Keywords:} Anion exchange; Anti-microbial properties; Fluoride removal; Graft copolymers; Maximum retention capacity; Muslin