Abstract

In this study, remediation results of trace metals in natural water and treated water using three functionalized nanofiber mats of cellulose and chitosan are reported. The nanofiber materials, packed in mini-columns, were employed for the remediation of five toxic trace metals (Cd, Pb, Cu, Cr and Ni) from natural water samples. Trace metals in real water samples were undetectable as the concentrations were lower than the instrument's detection limits of 0.27×10^{-3} (Cd) and 4.2×10^{-2} (Pb) $\mu g\ mL^{-1}$, respectively. However, after percolation through the functionalised biosorbents in cartridges, detectability of the metal ions was enhanced. The starting volume of the natural water sample was 100 mL, which was passed through a column containing the nanofibers sorbent and the retained metals eluted with 5 mL of 2.0 M nitric acid. The eluate was analyzed for metals concentrations. An enrichment factor of 20 for the metals was realized as a result of the pre-concentration procedure applied to handle the determination of the metals at trace levels. The order of remediation of the studied metals using the nanofibers was as follows: chitosan/PAM-*g*-furan-2,5-dione < cellulose-*g*-furan-2,5-dione < cellulose-*g*-oxolane-2,5-dione. The modified biopolymer nanofibers were able to adsorb trace metals from the river water and treated water, thereby confirming their capability of water purification. These materials are proposed as useful tools and innovative approach for improving the quality of drinking for those consumers in small scale households.