Towards the development of a reactive filter from green resource for groundwater defluoridation

Abstract

Abstract In order to develop a low cost reactive filter from a green biogenic resource, the shell of a Gastropod (GS) was calcined at different temperatures and the defluoridation efficiencies of the raw and calcined GS were evaluated in a batch process. The highest defluoridation efficiency was obtained with the GS calcined at 1000 °C (i.e. TGS1000). The time–concentration profiles of the defluoridation process were described by the pseudo-second order kinetic equation and the Temkin equilibrium isotherm equation gave the best description of the defluoridation process in synthetic feed water and groundwater (GW) system. The determination of the effects of hydrochemistry on the defluoridation efficiency of the TGS1000 showed that variations in pH value, organic load and ionic strength had no visible influence on the magnitude and trend. Amongst the array of interfering ionic species studied, only carbonate exhibited negative impact on the defluoridation efficiency. Experimental evidences revealed that the underlying mechanisms of the defluoridation process were diverse (ionic bond formation, electrostatic attraction, ion exchange and occlusion into Ca(OH)2 framework) and not straitlaced. Groundwater (GW) defluoridation, using TGS1000, showed that the residual F− in the defluoridated water increased with initial F− concentration. The value of the monolayer Langmuir sorption
capacity was lower in the GW system ( 

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