3rd International Conference of Multidisciplinary Approaches (iCMA), 2016
Faculty of Graduate Studies,
University of Sri Jayewardenepura,
Sri Lanka
ISSN: 2386 – 1509

USE OF METAL-COMPOSITE INCORPORATED/COATED BIO-POLYMER BEADS FOR THE REMOVAL OF FLUORIDE IONS FROM AQUEOUS MEDIA

Thathsara S.K.T, Cooray A.T., Ratnaweera D.R. and Kuruwita Mudiyanselage T.D.*

Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka

thilinidkm@gmail.com

ABSTRACT

Access to safe drinking water has declined over the last decades in almost every part of the world. Among many different water pollutants, fluorides play a major role. Accumulation of fluoride ions into natural water bodies largely happens through waste water discharge from industrial practices and weathering mineralization. Consumption of excess amounts of fluoride ions can cause both dental and skeletal fluorosis. Even though, the acceptable values for fluoride ions in drinking water recommended by WHO is 1.5 mg/L, recommended value of fluoride for topical countries such as Sri Lanka is 1.0 mg/L. This research highlights the implementation of metal incorporated/coated bio-polymer system for the removal of fluorides ions from aqueous media. Naturally existing, low cost and highly abundant polymer materials such as Alginate, Carboxy Methyl Cellulose (CMC) and Chitosan have been used as the matrix material of fluoride removal system. Since rare earth metals such as La, Ce and Zr show strong affinity towards fluoride, a tri-metal composite of those metals were synthesized using one step co-precipitation method. Characterized tri metallic composite was incorporated into a natural polymer to enhance fluoride removal efficiency. 1:1 ratio of tri metal composite incorporated alginate, CMC and chitosan beads and tri-metal coated alginate and CMC beads were synthesized separately. Freshly prepared 10 mg/L of fluoride solution was used to determine percent removal of fluorides and the amount of fluoride adsorbed per unit. All adsorption experiments were carried out in 250 mL plastic beakers with 100.00 ±0.01 mL test solution at pH 7.00±0.1 and room temperature (28 ± 1∘C). Rapid adsorption of Fluoride was observed within the first sixty minutes and equilibrium was established within 2 hours. The amount of fluoride adsorbed per unit for CMC, Alginate, Chitosan and tri-metal incorporated alginate, CMC and chitosan were 2.47±0.09, 2.95±0.11, 1.01±0.80 mg/g and 4.703±0.09, 4.67±0.08 and 1.07±0.03mg/g while tri-metal coated alginate and CMC were 3.77±0.004 and 2.98±0.06 mg/g. These composites were further studied using FT-IR techniques. Carboxy Methyl Cellulose-CMC, World Health Organization-WHO, Fourier transform infrared spectroscopy-FTIR

Keywords: Bio-polymer beads, Fluoride ions, Aqueous media, Metal-composite

Acknowledgement: Financial assistance by University of Sri Jayewardenepura, research grant ASP/01/RE/SCI/2015/31