

## **Defluoridation of Groundwater by Electrocoagulation: Performance Evaluation of Electrodes**

R. Yathushan\* and J.T. Cooray

*Department of Applied Earth Sciences, Uva Wellassa University, Badulla, Sri Lanka*

*\*Corresponding Author E-mail: mrt16051@std.uwu.ac.lk, TP: +94768430013*

Fluoride dissolves in groundwater due to water-rock interaction and human activities. Drinking water with a low or high level of fluoride can cause adverse health effects to humans. Sri Lankan drinking water standard for fluoride is 1.0 ppm but, most of the groundwater from dry zone areas of the country exceeds this level while some even exceed 5.0 ppm. Electrocoagulation is one of the best methods that can be used to remove excess fluoride from drinking water. During this study, the performance of different metal electrode pairs, the dependence of initial pH, the retention time of process, the effect of pH variation, applied voltage and conductivity were studied concerning the removal of fluoride. Al-Al, Fe-Fe and Al-Fe were chosen for performance evaluation of electrodes. At the same time, initial pH was varied from 6.5 to 8.0 by 0.5 uniform intervals, and samples were taken in each 30 minutes intervals up to 4 hours in all experiments to determine the removal efficiency. The fluoride concentration of samples, were determined by UV Spectroscopy. DI water with 10 ppm fluoride was used for all experiments and during this process voltage, conductivity, current density, electrode separation distance and effective area of electrodes were maintained at constant. Al-Al electrodes showed better performance at 7.0 pH in a low retention time of 90 minutes and Fe-Fe electrodes were effective at 8.0 pH in a high retention time of 120 minutes. Natural groundwater with a higher concentration of fluoride (5.36 ppm and pH 7.98) was tested using Al-Al electrodes. After 2 hours of process, fluoride concentration was reduced to less than 1.0 ppm level, for Fe-Fe electrodes more time was required than Al-Al electrodes. During the procedure, pH was stable for Fe-Fe electrodes, but for Al-Al electrodes, pH value was increased more than 8. Al-Al electrodes can be effectively used for defluoridation of groundwater in Sri Lankan arid zones.

**Keywords:** Defluoridation; Groundwater; Electrocoagulation