

Abstract FM 11

DETERMINATION OF CHEMICAL FATE OF FLUORIDE DISTRIBUTION OF MIHINTALE AQUIFER IN SRI LANKA BY EXPERIMENTAL AND MODELING METHODS

K Heenkenda^{1,2}, P Rukshagini², BAYB Yawardhana², IPL Jayarathna² and R Weerasooriya^{2*}

¹College of Chemical Sciences, Institute of Chemistry Ceylon, Rajagiriya, Sri Lanka.

²National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka.

In agreement with UN sustainable development goals, Government of Sri Lanka is committed to provide safe water to the entire nation by 2030. Presently over 3.6 million people in Sri Lanka are suffering from lack of safe drinking water due to high levels of fluoride and dissolved solids. In an attempt to investigate the fluoride distribution in Mihintale aquifer, soil samples of the aquifer were collected at the location (8° 21' 13.32" N; 80° 30' 7.61" E), and characterized. Kinetics studies, conducted in the batch mode, revealed that the interaction of fluoride with aquifer soil is of second order with linear regression of 0.9045, while the fluoride adsorption isotherm in the range of 0 to 20 ppm corresponds to Type V according to the IUPAC classification. Further, adsorption process of fluoride on to the aquifer soil fits the Langmuir adsorption model, which assumes homogeneous surface sites, with a regression value of 0.9894. Quantitative X-ray diffraction data showed the following mineral phases in the aquifer soil: quartz – 38.56%, albite – 16.73%, orthoclase – 8.10%, muscovite – 2.48% ankerite – 1.51%, indicating that the aquifer surface is heterogeneous. Thus, it appears that homogeneous sites domain in the heterogeneous surface selectively respond to fluoride adsorption. The pH_{zpc} of mineral surfaces is 5.5. Quartz is abundant among other minerals which has a pH_{zpc} value of 1.7. However, the surface charge of aquifer is not controlled by quartz. The vibrational spectrum of fluoride-aquifer sample showed chemical bonding between fluoride and surface sites. However, the exact identification of the mineral site requires *in-situ* surface spectroscopic measurements.

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*ruks2007@gmail.com