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Chemical Fate of Fluoride Distribution of Mihintale Aquifer in Sri Lanka by Experimental and Modeling Methods.

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United National Sustainable Development Goals aim to provide safe water for entire globe by 2030. In agreement with UNDP goals, Government of Sri Lanka is committed to provide safe water to entire nation by 2030. Presently 3.6 million people in Sri Lanka, largely concentrated to dry climatic region, are suffering from lack of safe water. Excess fluoride, TDS, hardness and nitrate are priority pollutants in Sri Lankans potable water. Excess fluoride in groundwater is a severe problem in Sri Lanka and other tropical regions in the world. The origin of fluoride in Sri Lankan groundwater is lithogenic. The fluoride distribution maps of Sri Lanka were compiled in 1985 and in 2012; in both cases the distribution patterns exhibit marked similarity signifying its lithogenic origin as governed by climatic and geological factors. However, precise mechanism of the evolution of fluoride in water is inconclusive to date. The ultimate aim of this research is to develop a thermodynamically consistent model to define fluoride evolution in groundwater of a selected location in Mihintale. This model will be developed from the data gathered from experiments done for pH_{zpc}, pH variation with concentration, adsorption isotherm models, kinetic runs and characterization data of the aquifer such as XRD, SEM, particle size, and specific surface area. Recently mechanistic models are developed based on 1-pK or 2-pK complexation theory. The mechanistic model based on 2-pK concept has been widely used, but shows chemical inconsistency; therefore, charge distribution multi-site complexation (CD-MUSIC) model based on 1-pK developed utilizing Pauling's valance bond theory will be used to define the chemical fate of fluoride. This method can be used to quantify multiple sites of fluoride adsorption.

Keywords: *complexation, fluoride, groundwater, model*