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Quantitative assessment of fluoride adsorption on kaolinite mineral water interface for development of a de-fluoridating methodology for ground waters

Excessive ingestion of fluoride through drinking water causes dental and skeletal fluorosis in human. Concentration of fluoride in domestic wells in north central and certain south- eastern regions of the island exceeds WHO drinking water limits. The objective of this study is to investigate the fluoride adsorption process on kaolinite and to determine the trapping capacity of fluoride by kaolinite in order to develop a de-fluoridation method for ground waters.

Extent of fluoride ion adsorption on kaolinite has been investigated over a range of environmentally important pH values (4 –9) and three ionic strengths (0.1, 0.01 and 0.001 mol dm $^{-3}$ with $NaNO_3$). The amount of fluoride retained by kaolinite was found to be a function of pH, ionic strength of the medium. The lowest ionic strength gave the highest adsorption. Fluoride uptake by kaolinite was minimal at pH > 7 and increased with decreasing pH. Adsorption of fluoride decreased in the presence of calcium and magnesium in the medium over the pH range. Potentiometric titrations of calcium and magnesium in the medium over the pH range. Potentiometric titrations of kaolinite were performed under above three ionic strengths. The surface charge of kaolinite was pH dependant and the highest ionic strength gave the highest surface charge. pH zpc for kaolinite was 6.98 and kaolinite surface was found to be positively charge below 6.98. The active surface area of kaolinite was 17m^2 g^{-1}. With a column (1.5 cm2 cross section and 4.00 cm long) packed with kaolinite and silica (volume ratio 1:1) it was found that 40

% of fluoride could be adsorbed in a water samples of 200 cm 3 passed at a rate 1.00 cm^3 min^{-1}.