



CHEMICAL REMOVAL OF FLUORIDE FROM DRINKING WATER USING GYPSUM

A dissertation submitted to the
Faculty of Science & Technology

Uva Wellassa University

in partial fulfilment of the requirements for the award of the
Degree of Bachelor of Science

by

KALEHE ENDERAGE DILANI KUMUDU WASANA KUMARI

Mineral Resources and Technology Degree Program

Uva Wellassa University, Sri Lanka

2012

Abstract

An excess amounts of fluoride in drinking water cause detrimental health effects such as dental and skeletal fluorosis. According to the World Health Organization (WHO), the maximum acceptable concentration of fluoride in drinking water is 1.5 mg/L. According to Sri Lanka Standard desirable and permissible levels of fluoride are 0.6 mg/L and 1.5 mg/L respectively. In tropical countries like Sri Lanka, the lowering of the fluoride regulatory limits in drinking water is required due to high consumption of water by the people living in these regions. Therefore excess fluoride in drinking water must be removed to the permissible level. There are several techniques available to remove excess fluoride from drinking water based on adsorption, precipitation, ion exchange, membrane separation. Most of these methods are highly specialized and cost intensive in that they cannot be implemented successfully at community level. In this research fluoride removal ability was investigated using gypsum based on precipitate common ion effects. Gypsum was separated in to different particle sizes (mesh sizes: 500 μm , 250 μm , 125 μm , 63 μm). The definite (10 ppm) fluoride solutions were prepared and study the fluoride removal ability of the gypsum under different particle size, pH levels and variation of the dose. The residual fluoride concentration is decreased with the particle size of the gypsum and the maximum fluoride removal is obtained the gypsum particles which have diameter below 63 μm . The pH for maximum removal of fluoride was around 8. The residual fluoride concentration in solution decreased with the addition of gypsum. When gypsum content is in excess, the residual fluoride concentration has decreased showing an optimal value at 2.50 g gypsum. Gypsum can be used to mitigate fluoride in drinking water. The particle size effect on fluoride removal efficiency was accounted for to increase in specific surface area.