Preface

Water is not only an essential component for life but also a basic building block to maintain quality of life. Fluoride, a difficult to remove inorganic water pollutant, contaminates groundwater as well as surface water originating from some geological and anthropogenic activities. Fluoride contamination is a worldwide issue as chronic ingestion of fluoride at high doses leads to dental and skeletal fluorosis. Therefore, it is necessary to find out an effective and robust technology for the removal of excess fluoride from drinking water. Several conventional and advanced treatment methods have been tried to remove fluoride from groundwater under both laboratory and field conditions. However, still an efficient method of fluoride removal which is economic, with minimized disadvantages and suitable for household and small community scale application in the rural areas remains as a challenge to the water researchers.

In recent years, many naturally occurring geomaterials have been tested to find out a cost-effective alternative for fluoride removal. Limestone is one of the abundantly available low-cost mineral, mainly consists of calcium carbonate and shows fluoride removal capacity. The capacity of limestone can be increased by enhancing its dissolution in water by increasing the acidity of the water. Precipitation and adsorption are the two possible physical phenomenon involved in fluoride removal process when limestone is used.

The concept of increasing the activity of limestone towards fluoride removal using a suitable acid has been applied in this work. After some preliminary literature study and laboratory investigations, we have chosen phosphoric acid as it is an edible acid and is used in water purification. Limestone is naturally available in many areas of Northeast India and it is also very cheap. Here, we have reported a systematic study of fluoride removal and the mechanisms of fluoride removal using the PA-limestone combination in different ways, i.e., PA-limestone powder, modified limestone powder prepared by hydrothermal treatment in presence of PA, PA-crushed limestone treatment in a continuous-flow mode and in plug-flow mode from a laboratory-scale pilot test to user trial in the field. The aim of the present work was to develop a simple, efficient, low-cost, user and environment friendly fluoride removal method and to deliver the method for practical purpose, which perhaps been achieved reasonably. The detailed story of the endeavour has been narrated here.

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