



Dr. BRR. GOVERNMENT COLLEGE,  
JADCHERLA, MAHABUBNAGAR (Dist.)

Student Study Project  
2021 -22

DEPARTMENT OF CHEMISTRY

Topic

Removal of Fluoride from Ground Water

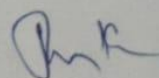
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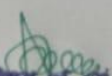
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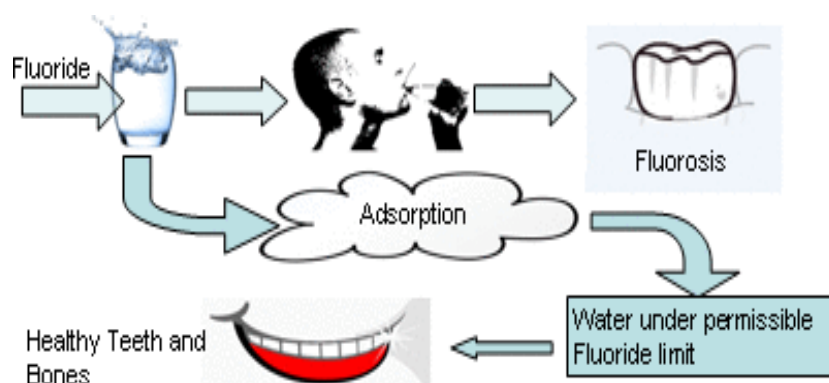
  
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## 1. INTRODUCTION

### 1.1 STATEMENT OF THE PROBLEM

Fluoride is the major inorganic pollutant of natural origin found in ground water. Fluoride in minute quantity is an essential component for normal mineralization of bones and formation of dental enamel. The safe limit of fluoride in drinking water is 1mg/L. Fluoride beyond desirable amounts (0.6-1.5mg/l) in ground water is a major problem in many parts of world. Many conventional methods available which of them removed excess of fluoride from water. They are generally ion exchange methods, precipitation methods and adsorption methods. But most of these methods have high operational ,maintenance cost, low fluoride removal capacity, lack of selectivity for fluoride ,generation of large volume of sludge and complicated procedure involved in treatment .With this in perspective current work was taken to explore feasibility of fluoride adsorption from aqueous solutions with cost effective cheap adsorbents



### 1.2 AIMS AND OBJECTIVES:

Taking severity of the problem into consideration, the present study is carried out to know the adsorption capacities of effective, cheap and naturally occurring, synthetic biomass materials like chalk powder, horse gram seeds powder, orange peel powder, red soil and multanimatti. So a considerable attention has been devoted to develop the better and suitable adsorbents for defluoridation[1] purpose, that would be cheaper and simply accessible.

## 2. REVIEW OF LITERATURE:

A variety of methods for fluoride removal are known. They involve precipitation and adsorption methods. Precipitation methods involve in addition of chemicals and formation of

fluoride precipitate or co-precipitate. The chemicals included lime magnesium compounds and aluminum sulphates. The well known Nalgonda technique involves in the addition of lime and bleaching powder followed by thorough mixing. The drawbacks of this method include the necessity for additional reagents, high treatment cost and the large volume of sludge produced.

Adsorption methods utilize the passage of fluoride containing water through contact bed. Fluoride is removed by ion exchange resins and adsorbents like zeolites, phosphatic compounds with activated alumina [2] and activated carbon. Venkatraman et al reported "avaram" bark based cation exchange resins for fluoride removal [3]. Active carbon prepared from coffee powder, rice husk [4], coconut shell, used tea powder, dried amla bark, saw dust and their sulphonated compounds with alums have also been so far used. Freshly fired brick pieces are used for the removal of fluoride. It is reported that the efficiency depends on the quality of freshly burnt bricks.

The use of bone charcoal [5] is reported to be an effective means for the reduction fluoride, but it is found to be pH dependent.

### **3. RESEARCH METHODOLOGY:**

In this paper an attempt has been made to suggest certain low cost materials as effective adsorbents of fluoride. The adsorbents primarily screened were multanimatti, red mud, horse gram powder, chalk powder, and orange peel powder. Initially all the adsorbents are screened by adding 1 gm of each of adsorbent to 100 ml of stock solution of fluoride.

#### **3.1. PREPARATION OF FLUORIDE STOCK SOLUTION:**

Dissolve 0.2210 gms of anhydrous NaF in distilled water and dilute to 1000ml which is having concentration of 100 ppm.

These adsorption methods are adopted for the removal of fluoride and these methods are suitable when the fluoride is present in low concentrations. For this purpose an aqueous solution of 100 ml quantities of various concentrations of fluoride that are prepared from stock solution of fluoride are taken in 100 ml stoppered bottles and 1 gram of each of the adsorbents is added to the respective solutions. Batch adsorption experiments are carried at room

temperature by varying contact times. The initial and final concentration of fluoride in different test solutions were determined by spectrophotometer and percentage removal of fluoride was determined which were produced below.

**Table 1: Percentage Removal of fluoride with Different Adsorbents**

s. no	Adsorbents	Initial Concentration of fluoride in mg/L	Final Concentration of fluoride in mg/L	Amount adsorbed	% Removal
1	Red mud	10	2.9	7.1	71%
2	Orange peel powder	10	2.1	7.9	79%
3	Horse gram seed powder	10	2.5	7.5	75%
4	Chalk powder	10	1.4	8.6	86%
5	Multanimitti	10	4.4	5.6	56%

#### **4. RESULTS AND DISCUSSION :**

The adsorbents selected for the present study are chalk powder, horse gram seed powder, orange peel powder, red mud, and multanimatti. From the values obtained from the experiment it is observed that the order of adsorption is in chalk powder>orange peel powder>horse gram seed powder> red mud > multanimatti.

The adsorption capacity is more at lower concentrations compared to higher concentrations of fluoride .In the current study ,it is observed that the physical adsorption by these natural adsorbents leads to the cheap, non toxic ,easily and locally available materials

.The parameter like contact time of adsorbent with the fluoride sample solution was also investigated. It is found that removal of fluoride ions increased with increase in contact time at initial stages of addition. It is noticed that typically 70-80% of the fluoride adsorption occurs within the initial hours of the contact time of adsorbents.

## **5. CONCLUSIONS AND SUGGESTIONS:**

This paper provides an overview of various low cost adsorbents used for the effective removal of fluoride from water. Most of the adsorbent's performance depends on contact time. The removal capacity increases by increasing contact time to certain extent. The other untreated adsorbents are also available and hope that it will encourage even more rapid and extensive developments for the treatment of fluoride in drinking water.

## **6. REFERENCES:**

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