ABSTRACT

This thesis embodies the results of the laboratory studies on defluoridation of water with a few selected adsorbents. Based on these results an indigenous defluoridation unit at domestic level is developed, the design and specification of which are also given. Field trials and the success of those trials are also discussed.

The thesis is divided into three main chapters.

In the first chapter a general introduction on fluoride toxicity, an overview of fluoride levels in naturally occurring water sources, fluoride bearing minerals in India and a review of various defluoridating agents studied so far in the literature are given in detail.

The second chapter deals with the laboratory studies with a few selected adsorbents viz. magnesium oxide, activated alumina, tricalcium phosphate and bone charcoal for defluoridation of water. The methodology for the experimental determination of defluoridation capacities of the adsorbents is presented. Experimental details regarding the studies on the effect of certain variables like time period of contact, particle size, pH, temperature, concentrations of fluoride ion and
concentrations of other ions like chloride, sulphate and bicarbonate are also presented. Determination of fluoride using the ion selective electrode method is described.

Results of the experiments carried out are analysed in order to choose the best adsorbent material for development of an indigenous defluoridation unit. The mechanistic aspects of defluoridation of water with respect to each of the adsorbents are thoroughly discussed.

The third chapter presents the details of the design and specifications of the model developed, cost analysis and results of the field trials. The performance of this unit and its acceptability by the users are presented in detail.

A consolidated list of references consulted is given at the end of the thesis to facilitate easy reference; references pertaining to each chapter are not separately listed to avoid duplication.