INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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There are several reports on co-occurrence of arsenic, nitrate, iron and sometimes fluoride in drinking water sources especially in groundwater at wide range of concentrations. The main aim of this study was to develop a reactor system using mixed bacterial culture for concurrent removal of arsenic, nitrate, iron and fluoride from groundwater. The flow through attached growth reactor (AGR) systems developed was successfully tested for its performance in treating synthetically prepared as well as real groundwater at varying combinations of concentrations of arsenic (200 – 1500 µg/L), nitrate (50 – 250 mg/L) and iron (2 – 13.2 mg/L) to meet drinking water standards. However, fluoride removal was not successful. Water treatment residue (WTR) was further tested and found to be efficient for fluoride removal to meet the drinking water standards. Besides this, a series of experiments were carried out in batch and semi batch modes of operation. Mineralogical investigation on the biosolids revealed that precipitation of arsenosulphide is the main mechanism of arsenic removal in absence of iron, whereas precipitations as arsenosulphide and/or co-precipitation with biogenic iron sulphides are the main arsenic removal mechanisms in presence of iron. Toxicity characteristic leaching procedure and long term leaching test results show that the biosolids including the spent WAC would not be classified as hazardous waste material and can be safely dumped in a sanitary landfill. This is the first report on biological arsenic and iron removal from real groundwater to meet drinking water standards.