Sensing and treatment of fluorine in drinking water

Water pollution has become one of the major problem all over the world which has adverse effects on our water bodies like lakes, rivers, groundwater and ocean. The major reason of the contamination are human activities like exploitation of groundwater, chemical discharges from industries etc. Ever increasing population and limited sources will led us to a problem of safe and pure drinking water. Thus, in future we may face the problem of procuring safe and clean water for human consumption. Before this problem turns into an epidemic it is better that we focus from now itself to monitor and control the quality of drinking water. As we know that the water purifiers waste almost 50% of the water which is not a sustainable technology. Thus, before treating the water it is important to analyse the impurities present in the water. For the analysis one needs a sensor which is selective and sensitive to the contaminants present in water.

Recently, fluorine has become a major problem in different states of India and worldwide. Chronic fluoride intoxication also known as fluorosis has become a worldwide health issue. It causes mainly dental and skeletal fluorosis. Fluorosis has become a major problem mainly in those geographical regions where the fluoride content is high in drinking water. Fluorosis is mainly a groundwater related disease which has affected majorly India and China. In India the majorly affected areas with fluorosis are Rajasthan, Gujrat and Andhra Pradesh.

Nanomaterial based sensors have large number of advantages over other sensors like low operating power, rapid detection and high sensitivity. As per the review done, the fluorine sensors reported are not sensitive and selective at same time. Further low cost easy to use sensor, with low detection range and highly specific in nature is required. More important one needs a sensor capable of dynamically sampling the water at fixed interval of time without any expert intervention. It is possible to achieve all the above parameters by developing low cost nanomaterial whose response changes in presence of analyte molecule of interest.

To develop a sensor with low cost and quick sensitivity two approaches are implemented. First approach is based on optical sensing. In this approach, N-doped

graaphene oxide was synthesized and used as base nano-material and HAP(hydroxyapetite) was synthesized to use as an analyte molecule to attract fluorine. Second approach is based on electrochemical sensing. In this approach three electrodes are used for sensing fluoride impurity in water. The screen-printed carbon working electrode is drop casted with graphene oxide solution and nHAP solution. Then the electrodes are dipped in the NaF solution of different concentrations Suitable voltage is passed through the solution in order to deposit fluoride ions on hydroxyapatite surface thus, forming fluorapatite and releasing hydroxyl ion.