

Scientists against nuclear weapons

Most of the public in India seem to be under the impression that all the scientists are in favour of nuclear weapons. This must be corrected. A scientist is a human being first. His humanity must come before his science. Making these weapons is a crime against humanity.

This was the view of great scientists like Albert Einstein and there is a large number of scientists (including in India) that think in the same way. It is the moral responsibility of scientists to resist the making and stockpiling of these inhuman weapons anywhere and also

help in the cause of public movement against these weapons.

G. RAJASEKARAN

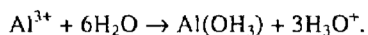
*The Institute of Mathematical Sciences,
Madras 600 113, India*

Alum treatment process for fluoride reduction in potable water

The desirable concentration of fluoride in drinking water should be between 0.6 ppm and 1.2 ppm (ref. 1). Higher or lower concentration of fluoride is harmful. In North Gujarat as well as many other parts of India, the amount of fluoride is very high and the public awareness about this is lacking. The water problem was considered only local but nowadays it is a problem of various states and nations. Many methods of fluoride reduction have been suggested. A simple, effective, low cost and easy-for-all household method of fluoride reduction in potable water is alum treatment process. Take a good quality plastic bucket having 15–20 l capacity with a tap at the bottom one inch above, as shown in the figure. Take water in the bucket and add desired quantity of good quality alum (4 g/10 l) in water and stir it well. Cover the bucket and allow to stand for 8 h. After

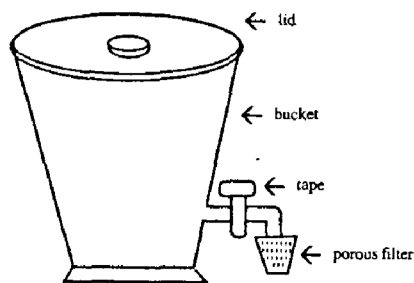
8 h, insert porous filter and take out water through the tap and use for drinking purpose. Throw white precipitates and water below the tap. Wash the bucket well and repeat the process. This simple process can be used by any person at any place without any additional requirements. The quantity of alum, i.e. 4 g/10 l was determined by experimenting with around 25 samples by the authors. The experiments could produce water having 1.1 ppm fluoride.

Let us review this method from different viewpoints and examine them one by one. pH alteration occurs as under.



The hydrolysis of Al^{3+} will decrease the pH of the solution. An addition of 4.8 g of alum to 10 l of water produces roughly six millimoles of hydrogen ions in 1 l water. These hydrogen ions are neutralized by carbonate and bicarbonate ions present in water. If the potable water has very low CO_3^{2-} and HCO_3^- and pH is less than 7.5, an addition of 100 ppm to 200 ppm of Na_2CO_3 may be necessary depending upon the CO_3^{2-} , HCO_3^- , etc. present initially. The residual Al^{3+} in solution is important. The solubility product of $\text{Al}(\text{OH})_3$ permits the passing of 10^{-15} M Al^{3+} for water at pH 8.0. An average consumption of 2.5 l of water a day allows only 0.6×10^{-13} g aluminium a day. Though aluminium is not known for toxicity, the

relation of regular aluminium intake and Alzheimer's disease should be checked carefully. Other fluoride lowering agents are as under. K_{sp} of CaF_2 is 5.3×10^{-9} , $\log \beta$ of $[\text{FeF}_6]^{3-}$ and $[\text{AlF}_6]^{3-}$ are 11.9 and 15.0 respectively. Using the same technique of fluoride lowering by precipitation of insoluble fluorides, newer procedures can be developed in which addition of $\text{Fe}_2(\text{SO}_4)_3$ or CaSO_4 would lower fluoride concentration by precipitating $[\text{FeF}_6]^{3-}$, CaF_2 , etc. Although iron and calcium are essential for human beings, a regular iron intake may cause adverse effect² because iron has no metabolic existence except for lactating mothers³. In contrast to Ca^{2+} , Al^{3+} is almost quantitatively precipitated. Thus alum addition is better than other additions. If alum addition is carried out in stainless steel vessels, it has been observed that there is corrosion problem especially at joints due to localized liberation of H_3O^+ ions. The problem is severe and may lead to pitting type of corrosion especially for stainless steels having higher proportions of Ni. The pitting increases with degree of deformation. Serious pitting may occur in the area of welds. Saline and acid waters are aggressive to mild steel. Salts, notably chloride and sulphate promote corrosion of steel⁴. Any possible introduction of microorganisms during storage and handling of alum should be checked. In case of likely contamination, the alum powder should be heated for 2–5 minutes before



adding to water. Alternatively, fluoride-regulated water should be disinfected before use. LR or Analar grade alum is better. There is a low cost alternative of commercial alum available at routine grain merchants. It is imperative to check the quality of this commercial alum for presence of chemical impurities. It is important for government and private bodies to arrange to provide Indian nationals the IP grade alum in bulk at reasonable cost.

Finally, the ill effects of excess fluoride in water is gradually in increasing order. The use of mass media like television, newspapers, radio, advertisement through ration card, etc. would be very helpful to conquer the fluoride devil at domestic level.

1. *Indian Standard Specification for Drinking Water*, IST, 1983, IS 10500.
2. Lippard, S. J., ACS Symposium series 209, Washington, 1985.

3. Bullen, J. J. and Griffiths, E., *Iron and Infection*, Wiley, New York, 1987.
4. Shreir, L. L., Jarman, R. A. and Burstein, G. T., *Corrosion*, Butterworth Heinemann Publishers, 1994, vol. 1, pp. 3.15-3.16.

JABALI VORA
J. D. JOSHI

Department of Chemistry,
North Gujarat University,
Patan 384 265, India

NEWS

TIFAC cell inculcates patent awareness in scientist-masses

The Patent Facilitating Cell (PFC) of the Technology Information and Forecasting Council (TIFAC) of the Department of Science & Technology extends technical and financial support for patenting inventions from universities. PFC has been providing technical and financial support to the legal protection of inventions resulting from DST-funded projects as also those from projects funded by other government agencies. PFC has filed 36 patent applications including five in foreign countries. It is also open to extending its facilities to state level institutions supported by state governments.

PFC has conducted 34 patent awareness workshops in different parts of the country sensitizing about 3200 scientists, technologists and policy makers from 80 universities, 80 R&D institutions, 105 industries and government departments. Mission agencies like DAE, ISRO, ICMR and ICAR have

joined hands with PFC in making their scientists aware of the basics and intricacies of patenting. PFC has brought out 30 issues of a monthly bulletin on IPR, which is circulated to about 10,000 readers. In its role of a watch dog, PFC has brought to the notice of the scientists, policy makers and public the patents related to turmeric, neem, par-boiled rice, tamarind, food products like dosai, quantum dots, heart pacemakers, etc.

A key feature of the *IPR Bulletin* is a listing of 'Patents for opposition', which enables the vigilant researcher or company to legally oppose the grant of those patents in India which potentially circumscribe or infringe their own legal rights. Databases on patent applications being filed in India and applications accepted by the Patent Office and open for opposition will be put on CDs and the CDs will be available to all on nominal charges.

In order to make such facilities available closer to the work sites of scientists all over the country, PFC has decided to start and support patent information centres at the state level by involving the state S&T councils and other agencies with an objective to create awareness and guide inventors regarding patenting. Five such centres have already been established in Andhra Pradesh, Manipur, Madhya Pradesh, Rajasthan and West Bengal. A three-day training programme arranged by PFC from 28-30 July 1998 at New Delhi, for training the officials of these centres was inaugurated by Murli Manohar Joshi, Minister (S&T) on 28 July. More such centres will be opened in this financial year.

PFC's *IPR Bulletin* is available from: Patent Facilitating Cell (PFC), Technology Information and Forecasting Council (TIFAC), Department of Science & Technology, Technology Bhavan, New Mehrauli Road, New Delhi 110 016.