

PIXE Elemental Analysis of Drinking Water Supplies

K.Ishii, H.Yamazaki, S.Matsuyama, Y.Takahashi, Ts.Amartaiyan, K. Katoh, H. Komori,
K. Hotta, D. Izukawa, K. Mizuma, H.Orihara*, K.Sera**, S.Futatsugawa***

Dep. of Quantum Science and Energy Engineering, Graduate School of Engineering, Tohoku University,
Aramaki-Aza-Aoba 01, Aobaku, Sendai 980-8579

*Cyclotron and Radioisotope Center, Tohoku University,
Aramaki-Aza-Aoba 01, Aobaku, Sendai 980-8579

**Cyclotron Research Center, Iwate Medical University,
348-58 Tomegamori, Takizawa, Iwategun, Iwate 020-0173

***Nishina Memorial Cyclotron Center, Japan Radioisotope Association
348-58 Tomegamori, Takizawa, Iwategun, Iwate 020-0173

Abstract

In this study, we carried out PIXE analysis of raw and treated water at five water treatment plants as well as of tap water from several houses located in each supply route. We used a simple fast procedure for preparing thin uniform targets of inorganic components in both soluble and insoluble fractions of aqueous samples in combination with preconcentration of trace heavy metals; that is, Nuclepore filtration targets for coarse particles, preconcentration targets for heavy metal ions and deposit targets for fine particles and soluble major constituents. The target preparation and the PIXE measurement are not time-consuming, and a broad range of concentrations (several tenths of ppb to a few tens of ppm) of 19 elements from Na to Pb is determined simultaneously with a precision sufficient to reveal the elemental distribution in the soluble and insoluble fractions. Tap water quality was examined as a function of elemental distribution in untreated water at the plants. We confirmed the increase of insoluble components of some heavy metals in untreated water taken from river due to heavy rainfall and the elution of Cu, Zn and Pb in drinking water by corrosion of the piping in some part of the water distribution systems.