SHIMADZU APPLICATION NEWS

LAAN-A-LC-E017

● HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

No.L264

Analysis of Bromate Ions in Drinking Water

Recently, advanced ozone processing of tap water has been performed mainly in cities with the purpose of removing the smell of mold. This has spawned a growing requirement for high-sensitivity analysis of the bromate ion, a typical oxidized halogen acid ion by-product of halide ozonation. The bromate ion has been identified as a carcinogenic substance, and in 1993, the World Health Organization (WHO) suggested 25μg/L as the limit value for bromate ions in drinking water based on the analysis techniques and accuracy available at that time. However, the USEPA (United States Environmental Protection Agency) has set the suggested limit value at 10μg/L or lower. With these trends, also in Japan, the high-sensitivity analysis of bromate ions at μg/L (ppb) levels has become necessary in terms of ozone processing and contamination from the environment. Introduced here are analysis examples for the bromate, iodate and chlorite ions using o-dianisidine as a reaction reagent and the Shimadzu Bromate Analysis System.

■ Analysis of Standard and Tap Water Samples

The bromate ion reacts in the presence of nitric acid, potassium bromide and o-dianisidine, and can be detected selectively using VIS absorption at 450nm. By optimizing the reaction conditions, it was possible to conduct stable analysis at μg/L (ppb) levels. Fig. 1 shows a chromatogram of the iodate, bromate and chlorite ions (10μg/L each) present in the 3-component standard solution. Fig. 2 shows an example analysis of tap water. Analysis was possible without using complicated pretreatment procedures, conducting only filtering using a membrane filter.

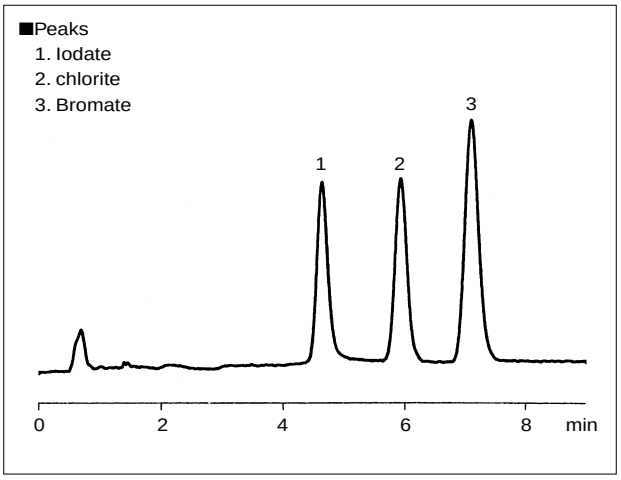

Fig. 1 Analysis of Standard Sample (10μg/L each)

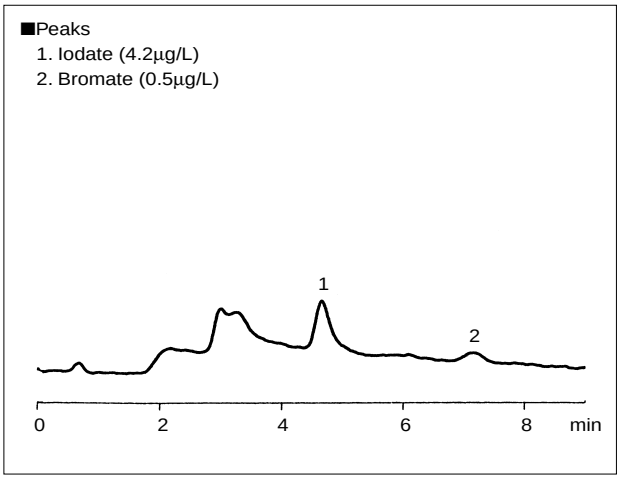

Fig. 2 Analysis of Tap Water Sample

Table 1 Analytical Conditions

Instrument	: Shimadzu Bromate Analysis System		A ; 4mM o-Dianisidine dihydrochloride in 20% Ethanol aqueous solution
Column	: Shim-pack IC-A3 (150mmL. × 4.6mm I.D.)		B ; 200mM Potassium Bromide in 2N Nitric acid aqueous solution
Mobile Phase	: 5mM Nitric acid aqueous solution	Flow Rate (reagent)	: 0.5mL/min
Flow Rate	: 1.0mL/min	Reaction Unit	: Reaction Unit for Bromate Analysis System
Temperature	: 40˚C	Temperature	: 80˚C
Injection Volume	: 200μL	Detection	: Absorption (450nm)
Reaction Reagent	: A / B = 1 / 1 (v/v)		

■ Analysis of Raw Water and Clean Water Samples

Fig. 3 shows an example of analysis of tap water before ozone processing, and Fig. 4 shows that of tap water after ozone and hypochlorous acid processing.

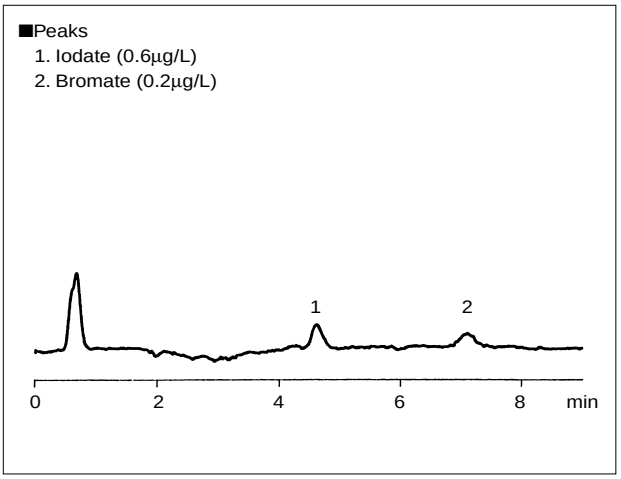

Fig. 3 Analysis of Raw Water Sample

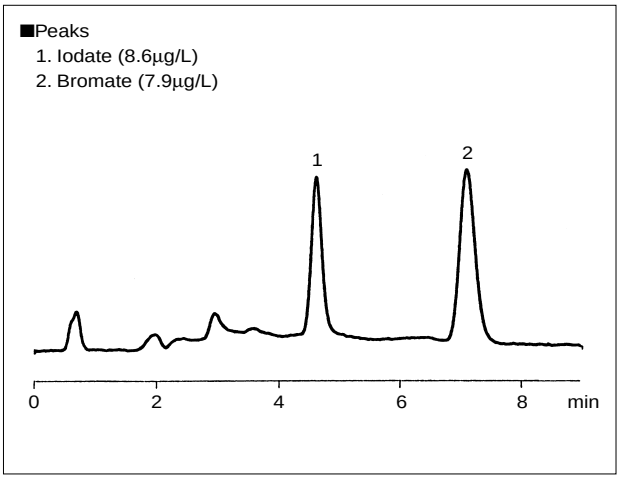

Fig.4 Analysis of Clean Water Sample

■ Analysis of Natural Water Samples

Figs. 5 and 6 show examples of analysis of natural water samples. Although it may vary depending on the sampling site, minute quantities of iodate ions are sometimes detected in natural water.

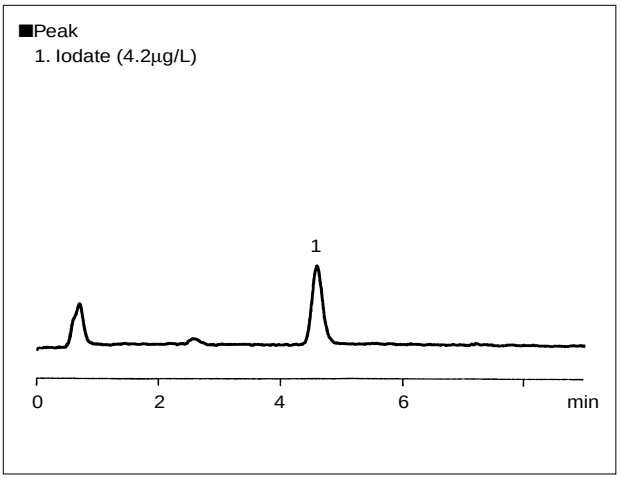

Fig. 5 Analysis of Natural Water Sample (A)

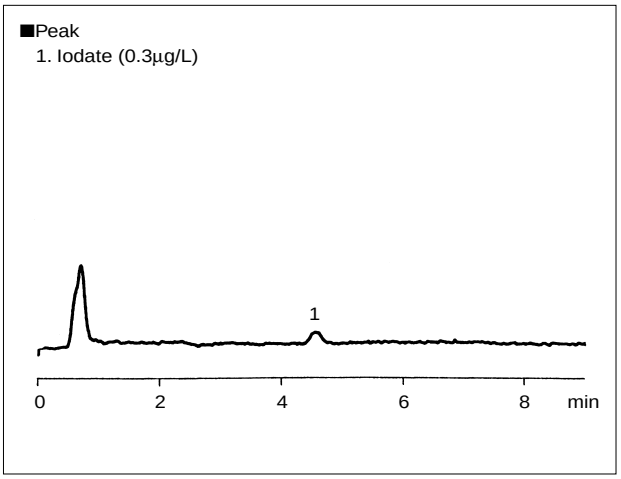

Fig. 6 Analysis of Natural Water Sample (B)

(Literature Cited)

1)C.R. Waner et al., Food Additives and Contaminants, 13 (1996) 633

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