Analysis of Anionic Toxic Matter by Photometric Ion Chromatography

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Photometric ion chromatography (PIC) is an ion analysis method that uses a light-absorbing ion in the mobile phase and measures the appearance of a transparent sample ion in terms of the absorbance decrease. PIC, therefore, has the advantage that it can be performed on a conventional high-performance liquid chromatograph equipped with a photometric detector. We applied this method to the analysis of anionic toxic matter present in the environment as a pollutant.

i) Recently acid rain has become a matter of public concern. Ion chromatography is an effective method to determine the composition of ions in the rain. After filtration through a 0.40 μ m pore size membrane filter, the rain water was ready for injection. Chloride, nitrate and sulfate were separated within 20 min on a Zipax SAX column (2.1 mm i.d. $\times$ 50 cm), with 0.5 mM phthalic acid of pH 6.5 as the eluent (1 ml/min).

ii) Residual bromate in bread has become a

problem, since potassium bromate used as a food additive for the maturation of flour is now considered to be carcinogenic. After extraction with water and elimination of proteins and chloride ions, the extracts from bread were subjected to PIC. The level of bromate ions in all of 8 commercially available breads was found to be below 1 ppm.

iii) Sodium chlorite, used as a bleaching agent in foods, should be removed or decomposed during the production process. After treatment of the extracted sample solution with a Bond Elut SAX cartridge for the elimination of organic acids and sugars from inorganic anions, chlorite ions could be measured by PIC. The level of chlorite ions in all of 9 commercially available candied foods was found to be below 5 ppm.

iv) Levulinic and formic acids may be present in soy sauce. These are undesirable by-products formed during the process of acid hydrolysis of soybeans. The sample was passed through a cation exchange resin column (Dowex 50 W $\times$ 8) for the purpose of eliminating amino acids and most of the salts in soy sauce. Moreover, the solution was treated with a Sep Pak C₁₈ cartridge before injection into the PIC system. It was observed that the levels of both levulinic and formic acids in soy sauces were nearly parallel with each other.

The above findings indicate that the PIC system should be useful in the analysis of ionic toxic matter, if samples are pretreated appropriately.