

## Summary

The application of ion chromatography with isocratic elution and conductivity or UV detections in species analysis of bromide and bromate, as well as chromium(III) and chromium(VI) ions in environmental samples has been presented.

In the first part of the study, the principles of ion chromatography including columns, eluents, suppressors and detectors are described.

In the experimental part two methods of determination of bromate and Cr(III)/Cr(VI) in water samples are described.

First of them – direct method of bromate determination – consists in simultaneous separation of  $F^-$ ,  $BrO_3^-$ ,  $Cl^-$ ,  $NO_2^-$ ,  $NO_3^-$ ,  $Br^-$ ,  $PO_4^{3-}$  and  $SO_4^{2-}$  ions, using carbonate eluent and conductivity detection.

The method using a modern, high – selective anion-exchange column makes it possible to determine bromate even in the presence of high concentration of chloride ions, which usually interferes in such kind of analyses.

The second method – indirect method of bromate analysis – consists in a post-column derivatisation of bromate to tribromide ions and their detection in UV detector at 267 nm.

The influence of common inorganic anions on the quality of determination and methods validation was checked. The obtained results show that these methods are suitable for the determination of bromate in drinking waters at  $\mu\text{g}/\text{dm}^3$  concentration levels. More accurate and sensitive is indirect method which requires more complicated procedures.

Both methods were applied to the determination of bromate in ozonated and raw drinking water. The dependence of time and sample storage conditions on bromide and bromate concentration and recovery from analysed samples were tested.

In the next part of Experimental the methods of determination of chromium(III) and chromium(VI) ions in water are described.

First of them concerns an analysis of chromium species and involves their separation on a column with mixed beds and UV detection of Cr(VI), and Cr(III) after oxidation to Cr(VI). This method is suitable for simultaneous determination of Cr(III) and Cr(VI) at a low  $\mu\text{g}/\text{dm}^3$  level.

The second described method of chromium analysis concerns selective determination of Cr(VI) ions which are the subject of interest for analytical chemists and toxicologists, due to their strong carcinogenic properties. The described method allows accurate and sensitive analyses of Cr(VI) at less than 1  $\mu\text{g}/\text{dm}^3$  concentration level, even in samples with complex matrix.

The both described methods were successfully applied to species analyses of chromium in drinking waters, rain waters, lake waters and water extract from galvanic solid samples.

The work includes extensive literature review on species analysis of bromate and chromium species in environmental samples. According to the literature the determination of bromate and chromium species is possible even at low concentration levels, but these so-called “hyphenated techniques” require very expensive and unique systems. Thus, these techniques are not used in routine laboratories because of the price and high technical requirements.

The methods described in this work do not require such sophisticated apparatus. The application of simple ion chromatography system with conductivity or UV-Vis detector, as well as suitable separation columns

and procedures allows to determine bromate and Cr(III)/Cr(VI) ions at  $\mu\text{g}/\text{dm}^3$  concentration levels.