Chromatography of Natural, Treated and Waste Waters

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Preface

Chromatographic techniques are becoming increasingly used for the determination of organic and organometallic compounds, cations and anions in all types of water ranging from non saline waters, ground and surface waters, potable water, sea and estuary waters and various industrial effluents. The techniques are then especially useful when mixtures of various substances are present and facilitate the determination in a single analysis. Extremely low concentrations can be determined.

Basically the techniques can be divided in three categories, those applicable only to relatively volatile substances such as gas chromatography, those applicable to non volatile substances such as thin layer chromatography and those applicable to both volatile and non volatile such as high performance liquid chromatography and other techniques and ion chromatography.

The purpose of this book is to draw together and systemise the body of information available in the world literature on the application of chromatographic procedures to the determination of all types of compounds and elements and mixtures thereof in non saline and seawater and treated waters. In this way reference to a very scattered literature can be avoided.

Methods are not presented in detail, space considerations alone would not permit this. Instead, the chemist is presented with details of methods available for a variety of types of water samples. Methods are described in broad outline, giving enough information for the chemist to decide whether he or she wishes to refer to the original paper. To this end information is provided on applicability of methods, advantages and disadvantages of one method compared to another, interferences, sensitivity, detection limits and data relevant to accuracy and precision.

The book commences with a chapter in which the principles and theory of various chromatographic techniques are discussed. Ion chromatography (Chapter 2) is a relatively recently introduced technique that has found extensive applications in the analysis of mixtures of anions and to a lesser extent of organic compounds and cations. Codetermination of

anions and cations is possible. A variant of ion chromatography, namely electrostatic ion chromatography has to date found a very limited application to the determination of anions and is discussed in Chapter 3.

High performance liquid chromatography (Chapter 4) which is displacing conventional column chromatography (Chapter 6) has found numerous applications in the analysis of organic compounds, also metal organic compounds of mercury, tin, arsenic, manganese copper and lead. It has fewer applications in the determinations of anions and cations.

Various miscellaneous column chromatographic techniques including ion pair, micelle, ion exclusion, size exclusion and gel permeation are discussed in Chapters 7–11. All of these techniques have found limited selected applications in the determination of organic compounds, cations and anions.

Ion exchange chromatography (Chapter 12) is a well-established technique applicable to the determination of particular types of organic and organometallic compounds and anions and cations as has capillary column coupling isotachoelectrophoresis (Chapter 13).

Chapter 14 discusses the very useful technique of thin layer chromatography. It has extensive applications in the analysis of complex mixtures of organic compounds and also has found limited applications in the analysis of organometallic compounds. No applications to anions and cations have been reported to date. The technique can also be used to prepare extracts suitable for subsequent examination by infrared spectroscopy or mass spectrometry.

Gas chromatography has, of course, been used extensively in the analysis of many types of organic compounds with boiling points up to about 250°C, also to the analysis of organic compounds of lead, mercury, selenium, tin, manganese and silicon. Derivitisation of these compounds to produce compounds sufficiently volatile to be amenable to gas chromatography is frequently practised. Gas chromatography has also been applied to the determination of arsenic, antimony, selenium, tin, beryllium and aluminium and the common anions such as sulphate, nitrate, phosphate, sulphide, cyanide and thiocyanate.

Compounds that have been separated by way of gas chromatography and liquid chromatographic techniques cannot be identified by their retention time alone as many types of compounds have similar or identical retention times. Increasingly, in recent years, this problem has been overcome by connecting a mass spectrometer to the outlet of the separation column applications of mass spectrometry are discussed in Chapters 5 (high performance liquid chromatography) and 16 (gas chromatography).

The work has been written with the interests of the following groups of people in mind: management and scientists in all aspects of the water industry, river management, fishery industries, environmental

management, sewage and trade effluent treatment and disposal, land drainage and water supply; also management and scientists in all branches of industry which produce aqueous effluents. It will also be of interest to agricultural chemists and to the medical profession, toxicologists, public health workers, public analysts, environmentalists and oceanographers.

Finally, it is hoped that the book will act as a spur to students and to industrial and academic staff concerned with the development of new analytical methods.

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