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Chemical Speciation in the Environment; List of contributors; Contents; Preface; 1 Introduction; 1.1 The need for speciation; 1.2 Aims and structure of the book; 1.3 Definition of speciation; Acknowledgement; References; Part I: Techniques for speciation; 2 General strategies for speciation; 2.1 Speciation - the analytical challenge; 2.1.1 Introduction; 2.1.2 Disturbance of equilibrium state; 2.1.3 Speciation based on calculation methods; 2.2 Experimental approaches to speciation; 2.2.1 Technique selection guidelines; 2.2.2 Selective measuring techniques 2.2.3 Preliminary fractionation strategies 2.3 Fractionation of species based on selective sizing; 2.3.1 Sizing based on sieving and centrifuging; 2.3.2 Ultra-filtration, dialysis and gel permeation chromatography; 2.4 Differentiation on the basis of charge and size effects; 2.4.1 Electrophoresis (flat bed and capillary); 2.4.2 Ion-exchange columns; 2.4.3 Chelating resins; 2.4.4 Adsorption columns; 2.4.5 Liquid-liquid extraction; 2.5 Chromatographic methods of separation; 2.5.1 Open-column liquid chromatography; 2.5.2 High-performance liquid chromatography; 2.5.3 Ion chromatography 2.5.4 Gas chromatography 2.5.5 Supercritical fluid chromatography; 2.5.6 Planar chromatography; 2.6 Selective chemical extraction; 2.6.1 Sub-division of element content of soils and sediments on the basis of chemical reactivity; 2.6.2 Speciation schemes for soils and sediments; 2.6.3 Speciation strategies; 2.6.4 'Labile metal' determinations; 2.7 Electro-analytical speciation techniques; 2.7.1 Role of electro-analytical techniques; 2.7.2 Potentiometry using ion-selective electrodes; 2.7.3 Polarography; 2.7.4 Stripping voltammetry; 2.7.4.1 Anodic stripping voltammetry 2.7.4.2 Potentiometric stripping voltammetry 2.7.4.3 Cathodic stripping voltammetry; 2.7.5 Amperometric titrations and electro-chemical detectors; 2.8 Concluding comments; References; Further reading; 3 Direct methods of metal speciation; 3.1 Introduction; 3.2 Identification methods; 3.2.1 Co-chromatography; 3.2.2 Radioactive tracers; 3.2.3 Electronic spectroscopy; 3.2.4 Optical activity - the Cotton effect; 3.2.5 Magnetic susceptibility; 3.2.6 Vibrational spectroscopy; 3.2.6.1 Fourier transform infrared (FTIR) spectroscopy; 3.2.6.2 Raman spectroscopy; 3.2.7 Magnetic resonance techniques 3.2.7.1 Nuclear magnetic resonance (NMR) spectroscopy 3.2.7.2 Electron paramagnetic resonance (EPR) spectroscopy; 3.2.7.3 Double resonance techniques; 3.2.8 Nuclear spectroscopic techniques; 3.2.8.1 Mossbauer spectroscopy; 3.2.8.2 Nuclear quadrupole resonance (NQR) spectroscopy; 3.2.9 X-ray techniques; 3.2.9.1 Crystallographic X-ray diffraction; 3.2.9.2 Photoelectron spectroscopy; 3.3 Conclusions; Acknowledgements; References; 4 Hybrid methods of speciation; 4.1 Introduction; 4.2 Separation techniques; 4.3 Gas chromatography 4.3.1 GC coupled with atomic absorption spectrometric detection (GC-AAS)

Sommario/riassunto

Considerable recent research has focused on the topic of chemical speciation in the environment. It is increasingly realised that the distribution, mobility and biological availability of chemical elements depend not simply on their concentrations but, critically, on the forms in which they occur in natural systems. Continuing developments in analytical chemistry have made speciation practicable even where analytes are present at trace levels (as is often the case in natural samples). In the second edition of this book, the expertise of scientists involved in chemical speciation in various fields have been brought together to provide an overview of the current status of speciation science and indicate how the field may develop in the future

