

# Preface

Environmental chemistry is becoming an increasingly popular subject in tertiary education. Courses in chemistry, environmental science, civil engineering, public health, and environmental engineering all have to include environmental chemistry in their syllabuses to a greater or lesser extent. Many textbooks have appeared in recent years aiming to fulfill this requirement; however, most of these mainly deal with theoretical aspects of the subject. This book aims to supplement the existing textbooks by providing detailed, step-by-step instructions for experiments in environmental analytical chemistry. These could be used to teach the practical components of undergraduate and postgraduate (Diploma and Masters) degree courses. The book may also be useful to students on HNC and HND courses, and to those on training courses for technicians working in environmental or other (*e.g.* public health, sewage, water, industrial) laboratories. Relatively easy experiments, requiring only basic laboratory equipment and instrumentation have been selected. Some of the simpler experiments may also be used by secondary school teachers of chemistry to illustrate applications of chemistry to the environment, a topic of growing concern among today's school students. Many of the experiments can serve as a basis for more extensive surveys of the environment in school science projects or undergraduate research projects.

Treatment of general and analytical chemistry was considered to be outside the scope of this book. It is assumed that the student would be familiar with basic chemical theory, and laboratory procedures and practices. Anyway, many good textbooks dealing with these topics are available and the student can refer to these books in the text where appropriate. Nevertheless, some basic practices of analytical chemistry are dealt with in the introduction and in Appendix B, especially those aspects, which are relevant to environmental analysis. Also, worked examples of problems relating to analytical and environmental chemistry are included where appropriate.

The experiments aim to provide practical experience in the analysis of real environmental samples, and to illustrate the application of classical and instrumental techniques to environmental analysis. A brief introduction

explaining why a particular substance is important and describing its behaviour in the environment is given before each experiment. Easy to follow experimental procedures are then outlined. Suggestions for further study, questions and exercises, and recommended further reading, are given after each experiment. Most undergraduate laboratories would be equipped with the instruments required for carrying out these experiments. Anyway, if any instruments or materials are not available instructors can select experiments that do not require them.

This book is not a reference manual for professionals working in environmental laboratories; many comprehensive texts are available for this purpose. Nevertheless, it can serve as an introductory text to those entering into employment in environmental laboratories, especially for those from a non-environmental chemistry background. There is a strong bias in the book towards inorganic analysis. This is primarily because equipment for carrying out inorganic analysis is more widely available in teaching laboratories, and it is not meant to reflect the relative importance of inorganic/organic analysis. A large number of organic compounds are present at trace levels in the environment, and their determination requires the use of instruments that tend to be fairly expensive and may not be readily available in many laboratories (*e.g.* gas chromatographs equipped with mass spectrometer or electron capture detectors). Furthermore, organic analysis requires the purchase of specialised standards, which also tend to be quite expensive. Experimental procedures for these compounds are best left to a future volume dealing with “advanced environmental analysis”. Also, microbiological analyses, such as *coliform* and *Escherichia coli* tests, although extremely important from a public health point of view, were not included in the present volume, which is restricted to purely chemical analysis. Inclusion of these tests would have entailed adding considerable background material on environmental microbiology, general laboratory procedures for microbiological analysis, *etc.* not central to the theme of the present book. This shortcoming is regrettable, but unavoidable. These tests are described in several books dealing with microbiological analysis.

Many of the experimental procedures are based loosely on standard methods (APHA, US EPA, British Standards Institution, *etc.*). The main aim of the book is to serve as an educational tool in preparing environmental chemists for the more demanding regimen of a real environmental laboratory. If the book opens the student’s eyes to the problems and demands of environmental analysis it would have surely served its purpose.

Miroslav Radojević  
Vladimir N. Bashkin  
September 1998

While care has been taken to ensure that the information in this book is correct, neither the authors nor the publishers can accept responsibility for the outcome of the experimental procedures outlined in this book.