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COMPREHENSIVE ANALYTICAL CHEMISTRY

Edited by

G. SVEHLA, PH.D., D.SC., F.R.I.C.

Reader in Analytical Chemistry
The Queen's University of Belfast

VOLUME IV

Instrumentation for Spectroscopy
Analytical Atomic Absorption and Fluorescence Spectroscopy
Diffuse Reflectance Spectroscopy

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Preface

In *Comprehensive Analytical Chemistry* the aim is to provide a work which, in many instances, should be a self-sufficient reference work; but where this is not possible, it should at least be a starting point for any analytical investigation.

It is hoped to include the widest selection of analytical topics that is possible within the compass of the work, and to give material in sufficient detail to allow it to be utilised directly, not only by professional analytical chemists, but also by those workers whose use of analytical methods is incidental to their other work rather than continual. Where it is not possible to give details of methods, full reference to the pertinent original literature is made.

All the contributions to Volume IV are connected with spectroscopy. The aim of the chapter on instrumentation for spectroscopy (Chap. 1) is to assist the spectroscopist in selecting the proper instrument and/or the proper experimental conditions for his measurement. The contributions on atomic absorption and fluorescence spectroscopy (Chap. 2) and on diffuse reflectance spectroscopy (Chap. 3) cover modern techniques widely used nowadays in analytical laboratories. As usual, these contributions are written by outstanding internationally known experts in their fields. Contributions on other spectroscopic and optical methods will be published in further volumes.

Dr. C.L. Graham of the University of Birmingham assisted in the production of the present volume; his contribution is acknowledged with many thanks.

July, 1974. G. Svehla

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Chapter 1

Instrumentation for spectroscopy

I.L. MARR

1. Introduction

(A) SCOPE

In these days of increasing specialisation it becomes increasingly difficult for a chemist to be fully conversant with the theory of optics, of electronics, of instrument design, and so on, yet more chemists, and analysts in particular, are using complex pieces of equipment routinely in the course of their work. The description by Julius [1] of the infrared spectrometer which he built and then used to investigate the absorption spectra of organic compounds (in 1888) makes fascinating reading, but very few chemists today have either the time or the "know-how" for such occupations and the majority rely on the wide range of excellent, commercially available equipment. This chapter will not attempt to reverse this situation; rather, it will try to help the chemist find his way through a sometimes difficult and confusing field. It is hoped that he can then appreciate the advantages and disadvantages of different pieces of equipment, the kind of things which can go wrong in, and the limitations of, the devices and instruments which he uses.

So many different topics are dealt with in the following pages that discussion has had to be restricted to the most important facts. An attempt has been made to give references to the more detailed and most readily available sources wherever possible. Interesting though original papers may be, they are not always the best starting point for the newcomer to a field who must rely on textbooks for a clearer exposition of the problem, the answer, and the reasons. The author has consulted many such books and the reader will be referred to

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