

two inseparable companions to petroleum, namely, gas and water.

With the third work here considered, "Reviews", the Institute of Petroleum resumes its annual publication covering in the main the year 1946, including chapters omitted from the previous volume (1941-45) published in 1947. The most important of these is the section on lubrication and lubricants. Here again, however, the whole field of production and the wide range of petroleum derivatives are covered by experts, whose knowledge of research trends in each branch of the industry is firm assurance that different readers' interests are well and truly documented and brought into the correct perspective of the times.

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## COLORIMETRY IN CHEMICAL ANALYSIS

### Colorimetric Methods of Analysis

Including Some Turbidimetric and Nephelometric Methods. By Dr. Foster Dee Snell and Dr. Cornelia T. Snell. Third edition. Vol. 2: Inorganic. Pp. x + 950. (New York: D. Van Nostrand Co., Inc.; London: Macmillan and Co., Ltd., 1949.) 90s. net.

THIS second volume describes colorimetric methods of analysis for sixty-eight elements and compounds, a chapter being devoted to each, together with some turbidimetric and nephelometric methods. The authors in the preface point out the difficulty in the critical selection of procedures, stating that "when authors are highly critical, a book is correspondingly highly personalized and non-inclusive. When authors are uncritical, a book becomes a mere collection of methods." A survey of all papers relating to chemical analysis published in the year 1946 showed that 23 per cent related to the field of colorimetry, which emphasizes the difficulty in clearly indicating to the reader the most reliable methods.

In order to serve as a guide, the more important methods have been mentioned in an introductory portion to each chapter, and, where drinking water and sewage are concerned, the "Standard Methods for the Examination of Water and Sewage" of the American Public Health Association have rightly been given prominence. Methods which have been published as the result of collaborative study can generally be accepted as reliable without much further search of the literature; for example, in the United States, those of the Association of Official Agricultural Chemists in the U.S.A., or, in Great Britain, the Society of Public Analysts and Other Analytical Chemists. Methods which appear to have gained acceptance in the literature by a single contributor have frequently been too little studied, and errors may be pointed out some years after their original publication, as in Schoonovers's method for silver, using as a reagent *p*-dimethylaminobenzal-rhodanine, recently criticized in this journal<sup>1</sup>. Original papers by more than two thousand authors are referred to in the volume, so that the reader will have no difficulty in tracing the source of the information given; but the analyst would be well advised to study the fundamentals of colorimetry, instruments, etc., which are given in Vol. 1 before proceeding with any particular colorimetric analysis, since the many pitfalls encountered in colorimetry cannot again be described in this Vol. 2.

Considerable care has been taken in the methods of preparation of a solution—from most of the complexes the analyst is likely to encounter—in a form suitable for colorimetry, the methods of eliminating interfering substances being given when known. These methods will vary from complex to complex, for, as stated by the authors in the chapter on phosphorus, "The distribution of small amounts of phosphorus is so wide—metals and alloys, minerals, biological samples—that there are necessarily correspondingly wide needs for methods". There can be few problems in the colorimetric determination of phosphorus which are not referred to in the fifty pages devoted to this element; similarly, silicon has necessitated a very wide survey. The determination of iron by the use of the *o*-phenanthroline reagent illustrates the factors which must be taken into account in varying circumstances. The authors have described the concentrations of extraneous substances which may cause interference, effects of temperature, *pH*, the order of adding reagents and the period of standing, and time intervals between addition of reagents.

The method of extraction of ferric chloride from aqueous solutions by ether in order to eliminate interfering substances, and a suitable apparatus for this, are described and illustrated. It would be of great help if all original papers on colorimetry would include details such as these. It is sometimes difficult to obtain reagents sufficiently free from the element to be estimated to ensure insignificant blanks. Chapter 1 gives directions for the elimination of lead from most of the reagents used, and, while it is too much to hope that this system can be followed universally, it would frequently be most helpful in highly critical work, where the blank may have a value as high as the substance estimated. The use of the reagent 'dithizone'—diphenylthiocarbazone—has increased so widely in recent years that early in the volume a short general article has been devoted to its use, so that the principles involved in its colorimetry can readily be understood in subsequent applications.

Many methods somewhat scantily treated in the previous edition on account of lack of full information now appear as well-tried methods; for example, the modern method for the determination of very small amounts of arsenic by the molybdenum blue colour has been placed on a sound footing. Although more complicated than the Gutzeit method, the evaluation of the final colour may be made by a photo-electric colorimeter, thus eliminating the uncertainty accompanying the visual judgment of the colour of stains on paper. The determination of traces of toxic elements in foods and biological specimens has generally been adequately dealt with; but there are omissions—for example, beryllium is mentioned only in connexion with ores and alloys. The recent use of Naphtho-chrome Green *G* is omitted, although its use eliminates many of the difficulties formerly encountered. The importance of what are usually termed 'trace elements' in soil has not been lost sight of, reference being made to most elements necessary for growth.

This volume is one to which frequent reference will be made by all who need colorimetric methods of analysis; the quality of the paper, binding and printing are of the type essential to a standard work of reference. The general arrangement of matter is logical, and directions to the analyst are clear and concise.

JOHN KING

<sup>1</sup> Allen, J. A., and Holloway, D. G., *Nature*, **166**, 274 (1950).