MATERIALS SCIENCE SERIES

SYSTEMATIC MATERIALS ANALYSIS

VOLUME IV

EDITED BY
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Systematic Materials Analysis

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VOLUME IV

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Preface

It is both exciting and dismaying to observe the parade of new and refined instrumental methods available for the analysis of materials—exciting because these instruments provide opportunities for faster and more reliable answers to material analysis problems, dismaying because one is hard pressed to evaluate these various instruments for a given task. Materials analysis often involves the complete characterization of a material, including structural and textural analyses in addition to chemical analysis.

It has been the aim of the editors of *Systematic Materials Analysis* to satisfy the needs of the materials analyst in these areas by presenting brief discussions on a broad range of instrumental methods and bringing to their selection new approaches that will yield the desired information about a given material. These volumes not only comprise a brief comprehensive reference for the materials analyst but also provide a source of information for the engineer or researcher who must select the appropriate instrument for his immediate needs. Although the volumes are directed toward the physical sciences, they can also be of value for the biological scientist with materials problems and of use to the laboratory administrator as both convenient reference and guide for the purchase of new instrumentation.

Chapter 1 focuses on the selection of anlytical methods on the basis of specimen limitations and information desired. The selection is made by use of flow charts encompassing the various instruments outlined in the succeeding chapters. The unique character and utility of this work lie in the use of these charts, since they present a complete listing of analytical instrumentation arranged so as to permit selection of the best method(s) for a given analytical task. The student may thus gain insights into thought processes that are usually acquired only after years of experience in this field. Thus, these volumes can appropriately serve as a college text (third year to graduate level) as well as a reference work.

The chapters on specific instruments briefly outline the theories of operation, with detailed discussions of theory fully referenced, and describe the capability of the methods for qualitative and quantitative

measurements of chemical composition, structure, and texture (as applicable).

Topics such as the sensitivity and selectivity of each method are emphasized. References illustrating the operation of the instrument, as well as references to user-constructed accessories that extend and improve the instrument's capabilities, are included when applicable.

The wide variety of commercial instruments available precludes the inclusion of instructions for the operation of instruments and, consequently, the inclusion for the student of experiments based on these instructions. For the same reason, comprehensive descriptions and the inevitable comparisons of commercial instruments are beyond the scope of this work.

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To Ann and Myra Ann, our wives, we are grateful for their sustaining love and their continuing challenge to our growth as persons.

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