Book Reviews

A Guide to Materials Characterization and Chemical Analysis. Edited by John P. Sibilia (Sibilia Associates Inc.). Wiley/VCH: New York. 1997. $69.95. xii + 388 pp. ISBN 0-471-18633-3.

The second edition of *A Guide to Materials Characterization and Chemical Analysis* is an improved edition of the first guide with 2 new chapters (in a total of 15) that has expanded and elaborated on some of the leaner areas of the first edition. Contained in the fifteen chapters are descriptions of over one hundred major characterization techniques and some major modifications to them co-authored by a group of scientists at Allied Signal Inc. The editor, Sibilia, points out in the first chapter that this book "describes the capabilities of a modern, well-equipped analytical sciences laboratory". The book compiles these major techniques into 14 chapters (and an introductory chapter) with a focus on specific technologies; each subtopic lists the use, sample requirements, principles, applications, and limitations of the specific equipment or technique of interest. Although not to be used in place of a classical "physical methods" or "analytical methods" textbook in a course, the book provides an adequate starting point for the scientist interested in conducting research using or about a particular technique.

The fourteen techniques chapters include Molecular Spectroscopy, Magnetic Resonance Spectroscopy, Mass Spectrometry, Separation Techniques, Elemental and Chemical Analysis, X-ray Analysis, Microscopy, Image Analysis, Surface Analysis, Thermal Characterization of Materials, Rheology and Molecular Weight of Polymers, Physical Properties of Particles and Polymers, Applied Mechanics and Physical Testing, and a key addition to the second edition: Scientific Computation. All of Sibilia's chapter co-authors are too numerous to list in this review. Overall, the book is an extremely useful compilation of the important techniques one would expect to find in a well-staffed and well-funded materials characterization laboratory in industry or academics in such departments as chemistry, chemical engineering, physics, metallurgy, polymer science, and materials science.

This book is not a textbook, but it is a useful guide for both undergraduate and graduate students and their mentors who are on the cutting-edge of materials characterization and are looking for a few good techniques to expand upon, or the corporate scientist/manager interested in equipping an analytical laboratory. There are no "problem sets" in the chapters, but there are lists of typical experimental configurations and problems addressed by the techniques as well as enumerated lists of applications. Nearly every technique is accompanied by a schematic diagram, sample spectra/data, and a list of references.

Not all of the problems with the first edition were addressed in the second edition. Aside from the occasional spelling mistake or superscript that should be a subscript, the book was well edited, but I am not fond of the method of referencing. At the end of each subtopic within a chapter, a general list of references can be found, but they are usually not made with respect to specific comments or topics within the text; they serve as a literature list rather than references. Most figures, but not all, are also not referenced, which makes it difficult to refer to the primary literature as to how a specific spectrum was collected (e.g., pulse sequences in NMR).

There are some glaring omissions that one would not expect for a book on materials characterization. Magnetic susceptibility is missing from the topics on magnetism (albeit, it is not a resonance technique), but most materials characterization facilities consider a SQUID to be a cornerstone instrument in an electronic materials laboratory. Electrical conductivity measurements and luminescence and diffuse reflectance spectroscopies are also among the missing and are considered key techniques in materials characterization—criticisms for the third edition. Missing from the X-ray analysis chapter are techniques such as Guinier cameras (Debye−Scherrer cameras were mentioned), rocking curve analyses for epitaxial thin films, reflectometry for amorphous thin films, stress/strain analyses, and texture and phase maps which are often used in the semiconductor industry for wafer mapping.

Unlike other reference materials of this type, the editor worked hard to avoid using the book as a soap box for instrument manufacturers. There are no comparative shopping guides given within and very few subjective remarks found. Because manufacturers change products quickly to keep up with the rapidly changing science, there is not a list of suppliers—perhaps an actively changing website and references to that can be made in the next edition. If you are in need of a real "Joe Friday ... just the facts, Ma'am" resource guide to materials characterization tools and techniques, then Sibilia's second edition should be on your shelf.

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