Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gmcl19

Book Reviews

Version of record first published: 04 Oct 2006.

To cite this article: (1996): Book Reviews, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 281:1, 313-315

To link to this article: http://dx.doi.org/10.1080/10587259608042254

Mol. Cryst. Liq. Cryst., 1996, Vol. 281, pp. 313–315
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Book Reviews

Fourier Transform Raman Spectroscopy: From Concept to Experiment, Edited by D. B. Chase and J. F. Rabolt, Academic Press Inc., San Diego, 1994. 274 pages, ISBN 0-12-169430-5, $69.95.

Over the past decade, Fourier Transform (FT)-Raman spectroscopy has grown into a full-fledged spectroscopic tool. Using near-infrared excitation and a modified conventional FT-infrared spectrometer, FT-Raman spectroscopy has opened a new exciting path for materials characterization. This novel technique offers a number of advantages over conventional Raman spectroscopy and has found many applications in both science and engineering.

This multi-contributor book, from pioneers and leading researchers in the field, presents a number of aspects of FT-Raman spectroscopy. The book is organized into seven chapters: *1. Fourier Transform Raman Spectroscopy: From Concept to Experiment; 2. Sampling Techniques; 3. FT-Raman Spectroscopy as a Structural Probe of Polymers and Other Long-Chain Organic Molecules; 4. FT-Raman and Surface Spectroscopy; 5. Waveguide Raman Spectroscopy in the Near Infrared; 6. Applications of Fourier-Transform Raman Spectroscopy to Biological Assemblies; and 7. Interferometric Raman Spectroscopy of Gases.* These chapters effectively encompass a large number of subjects, including the historical perspective, the basic experimental considerations for the FT-Raman instruments, a variety of sampling techniques, waveguide Raman techniques, and many applications of FT-Raman spectroscopy. Each chapter starts with a short introduction, follows by detailed discussions of specific topics which highlight the recent research and developments with that particular area, and then ends by a summary with remarks on the problems and future directions. All the chapters in the book are well organized, extensively referenced and the text is nicely supplemented with appropriate figures and tables. For example, the chapter on *FT-Raman Spectroscopy as a Structural Probe of Polymers and Other Long-Chain Organic Molecules*, by Vickie M. Hallmark, demonstrates the use of FT-Raman spectroscopy in structural characterization of novel organic systems, including Langmuir-Blodgett films containing chromophores, polymers with backbone chromophores, polymers containing intrinsic and extrinsic chromophores, and biological chain molecules. The detailed discussions with well illustrated figures highlight the advantage of using FT-Raman spectroscopy with a near-infrared excitation in overcoming the severe obstacle of fluorescence from materials using visible laser in conventional Raman spectroscopy.

This book is highly recommended for anyone interested in either an excellent overview of FT-Raman spectroscopy and its applications or a quick reference book. It

should be useful to both academic and industrial researchers in the areas of analytical chemistry, polymeric and biological studies, materials science, and process monitoring.

Lian LI
Department of Physics and Applied Physics
Center for Advanced Materials
University of Massachusetts, Lowell
Lowell, Massachusetts, USA 01854-2881

The Rietveld Method; IUCr Monograph on Crystallography – 5, Edited by R. A. Young. International Union of Crystallography; Oxford University Press, 1995; ISBN 019 8559127; 298 pages.

The editor proposes that this book is "intended primarily to have tutorial and advisory value for those who already have some experience with [the Rietveld method]." It is indeed, as the editor states, not a 'proceedings', but rather a compilation of focussed reviews of the many topics of the technique. Overall, the book covers all the essential topics of the Rietveld analysis – from interactions of materials with X-ray and neutron sources to *ab initio* structure solutions with powder diffraction data. The author list covers a broad international spectrum of users and developers of the Rietveld method, including a short historical article by Hugo Rietveld. Extensive reference lists at the end of each chapter indicate further reading on the topics.

Various sections of the book are "stand-alone" in that they have significantly useful information for diffraction analysis with or without the Rietveld method. Most notable of these are the chapters on interactions of radiation with polycrystalline materials, data collection strategies, and reflection profile shapes in X-ray powder diffraction.

The price one pays with a compilation of papers of this sort is a lack of true introduction to the novice in the field. The editor states in the preface that "with Chapter 1, the beginner is also welcomed." However, this chapter contains many references to subsequent chapters which tend to leave the novice with a poorly understood concept, unless he/she wants to delve much more deeply. Connected with this are the very few references to the practical aspects and anticipated quality of results from the Rietveld analysis. For example, only an appendix to one chapter refers to the use of the Rietveld method for multiphase quantitative analysis.

Based on personal preference, this reviewer would have liked to have seen a more extensive historical review. I would find any discussion by Dr. Rietveld on the concepts leading to the inception of the method enlightening.

In final review of this book, I agree completely with an associate who said that this is essential reading for any individual who is interested in using the Rietweld method in materials analysis!

Gregory P. Hamill
Rigaku/USA, Inc.
199 Rosewood Drive, Suite 190
Danvers, Massachusetts 01923

Molecular Crystals by J. D. Wright (Second Edition), 1995, Cambridge University Press, 221 pages, ISBN 0 521 46510 9 (hardback); 0 521 47730 1 (paperback) $49.95 (hardback); $22.95 (paperback).

This is an excellent textbook for advanced undergraduates and graduate students. The book covers a very wide range of topics: purification and crystal growth, intermolecular forces, crystal structures, impurities and defects, molecular motion in crystals, optical properties, chemical reactions, electrical properties, chemistry of C60, NLO materials. Despite this wide coverage, the treatment of each topic is precise and useful, never becoming tedious. The wording while technically correct, is always easy to understand. In effect, this book is characterised by both rigour and ease of comprehension and is especially valuable to students who wish to acquire a basic knowledge of molecular crystals.

The revisions in this second edition are worthwhile. These include a discussion of the growing use of the Cambridge Structural Database in assessing the properties of intermolecular interactions, a survey of the popular field of fullerene research and an easy-to-read account of the physics and chemistry of NLO materials. The author has surveyed these topics critically and imaginatively. There is, for example, a tidy summary of the properties of C–H...O hydrogen bonds. Again, it is good to see a mention of Osawa's early contribution, in Japanese Language publications, regarding the possible existence of C60. The simple but effective description of phase matching in an NLO crystal is one of the best I have seen. A notable omission is the recently developed Monte Carlo type computational technique in the prediction of new and polymorphic crystal structures. In general, computational methods are not stressed–perhaps this is not altogether bad; however, some mention of these methods would have given a completely even-handed account of the subject.

This textbook is on its way to becoming a classic in the area of molecular crystals.

Gautam R. Desiraju
School of Chemistry
University of Hyderabad
Hyderabad 500 134 India

Editor's Note: For the review of the first edition of "Molecular Crystals" by John D. Wright, see C. J. Eckhardt, *Mol. Cryst. Liq. Cryst. (Letters Section)*, *5*, 223 (1988).