

BOOK REVIEW

Modern Powder Diffraction. Edited by D. L. BISH AND J. E. POST. Mineralogical Society of America, Washington, 1989. Vol. 20, xi + 369 pp., \$20.00.

Modern Powder Diffraction is a review based on a short course offered at the Mineralogical Society of America and Geological Society of America meeting held in St. Louis in November 1989. The editors have persuaded an outstanding group of crystallographers and/or mineralogists to contribute to this volume. Although many short courses (and subsequent reviews) are aimed exclusively at either the expert or the novice, this work offers significant input for both groups. In addition to its broad appeal, the work is timely, having many post-1988 references.

The first chapter, by R. C. Reynolds, utilizes a non-traditional (to crystallographers) introduction to diffraction that lends itself nicely to sample peak broadening effects frequently encountered in mineralogical samples. This is followed up in a later chapter on diffraction from small and disordered crystals that lays the groundwork for an understanding of the effect of particle size and strain on Bragg peak profiles.

Chapters dealing with the basics of data collection ("Instrumentation and Experimental Procedures" by R. Jenkins) and sample preparation ("Sample Preparation for X-ray Diffraction" by Bish and Reynolds) give thorough grounding in these areas. These are followed by chapters dealing with more modern techniques ("Synchrotron Powder Diffraction" by L. W. Finger and "Neutron Powder Diffraction" by R. B. Von Dreele), intended as introductions to the new user and which successfully manage to convey their uniqueness. For example, the feasibility of time-resolved studies at synchrotron sources and the special sample environments that can be utilized at neutron sources due to the greater penetrating nature of the neutron are covered.

Utilization of computers is surveyed in one chapter ("Computer Analysis of Diffraction Data" by D. K. Smith), which provides a compendium of available computer programs. This is followed by a chapter ("Profile Fitting of Powder Diffraction Patterns" by S. A. Howard and K. D. Preston) that exhaustively outlines profile-fitting theory and procedures, including practical examples.

Of particular interest to this reviewer are two chapters on "Rietveld Refinement of Crystal Structures Using Powder X-ray Diffraction Data" (Post and Bish) and "Quantitative Analysis" (R. L. Snyder and Bish). The former correctly credits Rietveld analysis for the recent revival in powder diffraction research and usefulness and suggests that the number of structure refinements using powder data may some day overtake those using single crystal data. The latter chapter offers a comprehensive listing of quantitative analysis schemes, with emphasis on more recent Rietveld and observed pattern fitting methods. The authors emphasize that use of these recently developed methodologies overcomes many of the pitfalls normally associated with quantitative diffraction analysis and will probably spur a renaissance in the analysis of minerals by diffraction.

Due to the comprehensive nature of this volume, I believe that a copy belongs on the shelf of every mineralogist that utilizes diffraction analysis. It serves to provide examples, sources, and references, as well as expert advice in every facet of X-ray powder diffraction analysis of minerals.

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