American Mineralogist, Volume 73, pages 1500–1501, 1988

BOOK REVIEWS

PROCEEDINGS OF THE INTERNATIONAL CLAY CONFERENCE, DENVER, 1985. Edited by L. G. Schultz, H. van Olphen, and F. A. Mumpton. Clay Minerals Society, Bloomington, Indiana, 1987. 456 pages.

The International Clay Conference is held every four years and brings together a body of scientists with a common interest in clay mineral research. This proceedings volume from the 1985 International Clay Conference (Denver, Colorado) is divided into nine sections, reflecting the diversity of the disciplines within clay science. It contains both review papers and research papers of authors from nineteen countries.

In the first section, Structure and Crystal Chemistry, S. W. Bailey summarizes recent work on structural refinements for phyllosilicates, including nearly forty studies published between the 1981 and 1985 International Clay Conferences. The brief summary includes structural information for each of the major phyllosilicate groups from studies using X-ray or neutron diffraction and other analytical techniques. This section also contains articles describing the infrared, EXAFS, and NMR characterization of clay minerals, including a study of the structural hydroxyls in the kaolin minerals by R. Prost and his colleagues.

The following two sections, Mineralogy and Geology/Diagenesis, contain several high-quality mineralogical studies concerning weathering, diagenesis, and a variety of other geological environments. One-third of the eighteen papers in these two sections relate textural information to geologic processes on macroscopic to submicroscopic scales. The Mineralogy section begins with a comprehensive and insightful treatment of mixed-layer clays by V. A. Drits. Drits combines many of the ideas on mixed-layer clays derived from X-ray diffraction studies, the fundamental particle hypothesis, polytype analysis, and geochemical studies. He concludes that the reaction from smectite to illite via a mixed-layer illite/smectite (I/S) intermediate phase probably proceeds through two separate reaction mechanisms: random I/S is produced by a solid-state transformation mechanism, whereas ordered I/S results from a dissolution-precipitation mechanism.

The next two sections, on Soils and on Iron and Aluminum Oxides, complete the articles dedicated to naturally occurring clays. The Soil section begins with M. J. Wilson's characterization of soil smectites and how they differ from bentonitic smectites. Recent work has shown that soil smectites are frequently rich in octahedral iron, have relatively large particles, and may contain non-exchangeable aluminous or organic interlayer material. The Oxide section contains both experimental studies and studies of natural materials. Although many of the articles technically involve non-clay minerals, the mineralogy, geochemistry, and occurrence of many oxides and their widespread association with clay minerals warrant their inclusion in this volume.

The Physical and Chemical Properties section is highlighted by an article by P. F. Low on the clay-water interface. His intriguing conclusion is that swelling pressure of clays and colloids, the force that pushes adjacent layers apart, arises primarily from hydration of the particle surfaces themselves rather than from the classically accepted notion of osmotic swelling arising from the interlayer cations.

The section on Catalysis and Surface Chemistry begins with a review by G. H. Bolt on cation adsorption in aqueous clay systems. This section includes two articles on the catalytic properties of pillared clays, which are particularly important in certain industrial applications.

The Organics on Clays section opens with a review paper, G. Lagaly's summary of recent work concerning problems involving clay-organic interactions. Lagaly characterizes the interaction of organics with clays in three ways: adsorption, ion exchange, and intercalation. He discusses recent observations on the structural aspects of adsorption of organic molecules, adsorption from binary liquid mixtures, interaction of clays with small "complicated" organic molecules, interaction with polymers, and the influence of organic materials on rheological properties of clays.

A final section, Industrial and Environmental Applications, contains papers dealing mostly with the thermal and physical characterization of clay materials and the effects of various treatments on their industrial uses.

Unlike so many proceedings volumes in this age of camera-ready manuscripts, this volume is typeset and extremely well produced. The figures, including optical, SEM, and TEM photomicrographs, are uniformly clear and communicative. The editors are to be congratulated on maintaining such high standards in an international volume. Although the subject matter within the volume is too broad to be fully appreciated by any individual clay specialist, these quadrennial volumes continue to be a useful way to keep abreast of the broader, multidisciplinary aspects of clay science.

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GEMSTONES. By Michael O'Donoghue. Chapman and Hall, London and New York, 1988. xiv + 372 pages. $55.00; in Canada, $77.00.

The aims of this book are to summarize the advances in gemology made in the last thirty years, to describe new natural or artificial gem materials, and to provide new data on materials previously described. The author sets himself a daunting task in view of the plethora of knowledge developed in this time span, and it is no surprise to find some unevenness in treatment as a result. This book should find a place in libraries of professional gemologists, gem identification laboratories, and educational institutions. It is of lesser interest to casual readers of gemological literature, novice gemologists, jewelers, collectors, or others with less formal gemological educational backgrounds.

A dilemma faced by the author was that in order to compare advances, or to certify them as such, past information had to be included to lead up to the new knowledge. Thus the text contains both elementary gemological information and advanced information, sometimes in uneasy juxtaposition, with the result that the book verges on becoming a textbook. To be admired, however, is the very large fund of information that is presented, gleaned from numerous books and articles that O'Donoghue has studied and has carefully credited.

In a departure from custom, O'Donoghue inserts a five-page glossary containing some 60 terms just before the text. Many of these terms seem elementary when compared to a host of more obscure terms in the text, which are not defined and should be.

0003–004X/88/1112–1500$02.00

The first chapter, a short one, discusses the formation and occurrence of gemstones but is almost wholly devoted to the inclusions found in gemstones with remarks on those characteristic of a selected number of species and varieties. The second chapter treats crystals, crystallography, physical properties (some), and common habits of growth for selected species. Chapter 3 summarizes standard methods of gem testing to provide a background for the information in chapter 4, which deals with advances in gem identification procedures and apparatus. Short discussions appear on thermal conductivity and its application to identification, new means of refractive index determination, reflectivity measurements, surface feature characterization and X-ray topography, electron microscopy, the microprobe, electron paramagnetic resonance, energy dispersive X-ray spectrophotometry, and UV spectrophotometry. Chapter 5 is devoted to color, treating theory, special color phenomena, chemistry of color, transition elements and roles in color causation, color filters, spectroscopy, and alterations of color via natural and artificial means, with notes on important changes for numerous materials from amber to zoisite. Chapters 6 and 7 deal with lapidary treatments and commercial aspects of gems, but no new information is imparted. Chapters 8 and 9, treating inorganic and organic gem materials respectively, comprise together the largest part of the text, some 166 pages, and provide concise, accurate statements of the varieties, qualities, and other properties of a large number of gem materials. Considerable recent information is incorporated on new materials as well as old, as well as additional data on properties, imitations, alterations, and other aspects. As may be expected from O'Donoghue's long-sustained intensive study of artificial gem materials, chapter 10, on synthetic and imitation stones, is one of the strongest parts of the book. Older methods of synthesis are reviewed and newer methods are explained. This chapter contains descriptions of mainly crystalline products synthesized for another purpose but pressed into service as useful gem material, or, when physical properties or rarity of the material governs choice, cut into gems for the collector. O'Donoghue provides a short list of synthetic crystals that could be used for gems but are not known to be cut. The last part of the book consists of appendices, including up-to-date property tables for identification, a short list of less common gem names used in the trade, a list of periodicals dealing wholly or in part with gemology, a list of birthstones, and lastly a bibliography of more than 275 entries, including articles and books from all periods. The illustrations include 42 well-drawn line sketches and diagrams and 18 color photos, most of them faithful in color to the originals, printed upon 4 bound-in plates. The materials used in the book are high quality paper, sewn gatherings, cloth boards, and a color dustjacket with a flap summary. Regrettably, a vita for the author is lacking, an omission that is altogether too common among publishers and a disservice to bibliographers of future generations.

The price of the book is sure to excite a few comments. As far as can be determined, it amounts to dinner for four persons, with wine, at a moderately expensive restaurant. In view of the very substantial old and new information incorporated in this book, I would choose the book.

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CRYSTAL STRUCTURES AND CATION SITES OF THE ROCK-FORMING MINERALS. By Joseph R. Smyth and David L. Bish. Allen and Unwin, Winchester, Massachusetts, 1988. 332 pages. $50.00

This book is meant to fill a void for those who use, or might use, crystal chemical data in their research or teaching. More specifically, according to the authors, the objective of the book is to make recent improvements in crystal structure data available to a larger group of petrologists and geochemists. To this end, the authors have put together a useful treatise on crystal chemical data.

For the most part, the book is composed of figures and tables. Eighty-four ball and stick and polyhedral crystal structure figures are presented along with structural data for over 200 minerals. The sulfides are not covered because the authors chose to emphasize ionic radii and classical ionic charges.

Basically two types of tables occur throughout the book. The first deals with unit cell data for each mineral and includes such items as cell parameters, formulas and formula weights, calculated densities, molar volumes, Z, crystal system, crystal class, and space group. The second group of tables deals with atomic site data and includes information about coordination number, point symmetry, fractional coordinates, interatomic distances, polyhedral volumes, quadratic elongation, variance of central angle, and electrostatic site energy. Site energies neglect the closed shell repulsive energy.

A separate set of tables located in the back of the book tabulates cation sites by mean interatomic distances. The tables also list site distortion parameters and electrostatic site energies, a potentially useful compilation for the study of trace and minor element distributions in minerals.

The data are arranged such that it is easy to locate information, and sufficient space exists between tables and figures to avoid that cluttered look so common in books of this type.

If you find you are commonly thumbing through reprints looking for such information as the point symmetry of a cation site or a polyhedral volume or the molar volume of a mineral, then you will find this a useful reference source for your library.

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ERRATA

Redetermination of the anorthite breakdown reaction and improvement of the plagioclase-garnet-Al_2SiO_5-quartz geobarometer by Andrea M. Koziol and Robert C. Newton (v. 73, p. 216–223). Page 216, line 7 of the abstract, and page 218, right column, 15 lines from the top, should read "in bars" instead of "in kilobars." Thus, the correct regression equation for the reaction 3 anorthite = grossular + 2 kyanite + quartz is P (in bars) = 22.80T (in °C) − 1093.

Editor's note: Corrected data regarding publication costs of the journal *Mineralogy and Petrology,* as given by Paul H. Ribbe ("Assessment of prestige and price of professional publications," *American Mineralogist,* v. 73, p. 449–469), are currently being assembled and will appear in *American Mineralogist,* v. 74.