# BOOK REVIEWS

Kerrick, D. M. *The $Al_2SiO_5$ Polymorphs*. Washington, D.C. (Mineralogical Society of America: Reviews in Mineralogy, Vol. 22), 1990. xii + 406 pp. Price $20.00

In the 25 volumes of *Reviews in Mineralogy* so far only two have been single author works, the first was on Fluid Inclusions by Ed Roedder and this is the second.

In this volume Dr. Kerrick presents us with a very thorough treatment of all aspects of the $Al_2SiO_5$ minerals from their structure, properties, etc. and their occurrence in granites and migmatites—something many readers will not have considered. The 11 chapters are entitled: Introduction; crystal structures, optical and physical properties; phase transition equilibria; non-stoichiometry; lattice defects; Al/Si disorder in sillimanite; the fibrolite problem; metamorphic reactions; reaction kinetics and crystal growth mechanisms; aluminium metasomatism; aluminium silicates in anatectic migmatites and peraluminous granitic rocks. The monograph is completed by a list of perhaps 1000 references.

The longest chapter is, not-surprisingly, on phase equilibria which occupies 72 pages. In this the author discusses all the main experimental studies and in each case adds his own critique of their experiments. In many cases he has given an alternative interpretation of the results presented but he has been extremely fair in his comments. His conclusion to this chapter is that he would like to see 'tight' experimental brackets on the andalusite–sillimanite equilibrium on materials which are as nearly as possible pure $Al_2SiO_5$ composition. As far as this reviewer can judge, Dr. Kerrick does not state his preferred figure for the $P$ and $T$ of the table point; however in the latest issue of American Mineralogicst a paper by Hemingway Robie, Evans and Kerrick (1991, pp. 1597–1612) gives the values of $P$ 3.87 ± 0.3 kbar and $T$ 511° ± 20 °C.

To the petrologist whose interests are more field-oriented, chapters 8, 9 and 10 will probably be very welcome because Kerrick has reviewed the literature very thoroughly and presents details of very many examples of the occurrence of these minerals, illustrated with maps and photomicrographs. The only map with which this reviewer has some familiarity has unfortunately had a scale superimposed which must be wrong by a factor of 10.

Many of the chapters begin with a quotation and these are very well chosen. One of them from W. S. Fyfe (1969), referring to the experimentalists' obsession with the system $Al_2O_3$–$SiO_2$, states: 'There are other systems that can perhaps yield more exact information about the same problems involving rocks, and our progress in this system does not exactly promote confidence in our abilities.' One quotation which the author did not use is from Richardson and Powell who were attempting to deduce the pressure and temperature of the metamorphic climax in the Central Highlands of Scotland: they wrote that 'this can be done without recourse to the bloodied field of the $Al_2SiO_5$ phase diagram.' F. J. Turner in the Second edition of his text book on 'Metamorphism' misquoted this (probably on purpose) and replaced the word 'bloodied' by 'bloody' and in the United Kingdom these two words are used quite differently. Dr. Kerrick has bloodied the field even more.

The reviewers and Editor of *Reviews in Mineralogy* made a wise decision in accepting Derrill Kerrick's monograph for this series because it is published at a price which most graduate students will be able to afford and no serious student of metamorphic petrology should be without this book.

W. S. MacKenzie

Schwertmann, U. and Cornell, R. M. *Iron Oxides in the Laboratory*. Weinheim, New York, Basel and Cambridge (VCH), 1991. xiv + 137 pp. Price £45.00.

The core of this book is a collection of recipes for preparing 5–10 g of the iron oxides and hydroxides. These are excellent and the preparative methods are clearly specified. The recipes are intended for those who require small amounts of these oxides for laboratory study and the methods are those proven by the authors to provide high purity products.

The book starts with an introduction to the major oxides and hydroxides and their characterization. The emphasis is on the pure oxides and mineralogists may well be disappointed by the lack of comparison with natural minerals. There is no mention of the auxiliary or impurity elements found in natural examples and the description of the occurrence of these minerals begins with their entry into the soil and weathering environments. There is, however, especial interest in the relationship between the methods of preparation and the crystal morphology and surface area of the product. This provides important pointers for mineral genesis in showing that crystal morphology can be influenced by the conditions of formation.

The chapter on methods of characterization is also a disappointment. The authors clearly excel in chemical methods but have problems conveying the details of instrumental methods. The section on quantitative colour will surely confuse even those who know something of the subject. This is unfortunate because the accompanying description of the colours of the oxides and their use is good. Crystallography is mentioned only briefly. This is surely an omission. The mention is in the context of explaining X-ray diffraction. The only purpose of this explanation in the remit of this book can be to provide an introduction to those meeting the method for the first time. I can only feel that this readership will be left bewildered. Here, as in many places in the book, a simple diagram would have conveyed the principal more succinctly and effectively.

There is some confusion over the intended readership of the book. Some words are defined, although I would have thought that 'hydroscopic' and 'supersaturation' would have been familiar or accessible to most readers. The definition of 'equant' as 'equally developed in all crystallographic directions' may be helpful but the definition of 'isometric' as 'equally developed in all directions' is clearly incorrect. 'Somtoids' is used and defined later as 'cigar shaped'. Some chemical shorthand; 'M KOH' for '1 M KOH' and 'RT' for 'room temperature' creeps in without definition. 'WHH' is used and defined although 'FWHM' is the more usual abbreviation. I never did find an explanation of 'BET' or 'pzc'.

The preparation of the book lacks care and the typesetting seems to have been done without reference to the roots of English or common usage. Words are hyphenated to make the lines look pretty so the reader is faced with 'oc-(new line) tahedral' and 'di-(new line) ameter'. 'Ex-ist' and 'be-low' cannot really have been necessary and 'add-(turn two pages of figures) ed' is ludicrous. There are many other such errors and inconsistencies too numerous to list here.

The book will be well used for the recipes it contains for preparing the iron oxides and hydroxides and it is a pity that the faults are so distracting. A good editor would have removed most of the problems.

J. F. W. BOWLES

Ganguly, J. and Saxena, S. K. *Mixtures and Mineral Reactions*. Berlin, Heidelberg and New York (Springer-Verlag), 1988. ix + 294 pp. Price DM108.00.

This is an advanced book on the thermodynamics of solid solutions and phase transitions, and their application to petrological problems. According to the Preface, it is written 'for an audience with a level of exposure in classical thermodynamics equivalent to that gained at the senior undergraduate level in chemistry in most U.S. universities'. When the first mineralogical application appears (on p. 6) the reader will discover that he or she needs an Honours degree in mineralogy as well, because a high standard of knowledge is assumed. It is a book of reference for experienced researchers or, in the British context, for Geology Ph.D. students who have started to build up a feel for mineral chemistry and thermodynamics and who have a sound working knowledge of mineralogy. I certainly would not recommend it to beginners.

Chapter 1 deals with the thermodynamic functions of solutions: fugacity, activity, Henry's and Raoults' laws. This leads in Chapter 2, to a general treatment of mixing models for non-ideal solutions including ternary solutions; and then the statistical formulation of entropy. It is a pity that no statement is made to the effect that all mixing models are probably approximations and that Avogadro is consistently misspelt. A variety of mixing models is discussed (although in general rather than realistic terms) and finally cation ordering is discussed. Phase separation is dealt with in Chapter 3, showing the relationship between $G$–$X$ curves and solvi, and treating spinodal decomposition and homogeneous and heterogeneous nucleation. Yet again, in a thermodynamics text, cooling trajectories are shown (Fig. 3.8 and again in appendix A.IV) on a TTT diagram suitable only for isothermal annealing, leading to the need for a time reversal as processes start, finish, finish again and finally start. To be fair, the authors do get it nearly right in A.IV, but they perpetuate an error in the main