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Structure Reports

Volume 51A of *Structure Reports*, covering structure determinations for metals and inorganic compounds published in 1984, has recently been published for the International Union of Crystallography by D. Reidel Publishing Company (Spuiboulevard 50, PO Box 17, 3300 AA Dordrecht, The Netherlands). This volume runs to 384 pages. The full price is 170 Netherlands Guilders, but scientists wishing to purchase a personal copy for their own use may do so at the reduced price of 85 Netherlands Guilders. Anyone wishing to purchase a copy at this special price must place the order direct with D. Reidel or with Polycrystal Book Service (PO Box 3439, Dayton, OH 45401, USA). A 15% discount on the full price is also available to institutions placing a standing order.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. O. Gould, Department of Chemistry, University of Edinburgh, West Mains Road, Edinburgh EH9 3JJ, Scotland). As far as practicable books will be reviewed in a country different from that of publication.

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Thermodynamics of point defects and their relation with bulk properties. By P. A. Varotsos and K. D. Alexopoulos. (Vol. 14 of the series **Defects in solids,** edited by S. Amelinckx, R. Gevers and J. Nihoul.) Pp. xiv+474. Amsterdam: North-Holland, 1986. Price Dfl. 260.00. Available in USA/Canada from Elsevier Science Publishers, 52 Vanderbilt Ave, New York, NY 10017, USA.

In this book the authors have undertaken the difficult task of establishing and correlating data and concepts derived from the study of point defects in solids; much of its content is a 'unified compilation of their publications'. Their dedication to the subject matter, and their enduring and systematic efforts towards deriving and identifying its many intrinsic details, are admirable. The book carries their crusade for the acceptance of their proposition, namely that

$$g^i = c^i B\Omega,$$

directly, and as closely as possible to the reader; this is its major objective. In this key equation, the symbols g, c, B and Ω are, respectively, the *Gibbs defect energy*, a *constant*, the *isothermal bulk modulus*, and the mean atomic volume; while the superscript i stands for f, m, or 'act' *i.e.* defect *formation*, defect *migration* (diffusion), or defect *activation*.

The book is divided into two parts: Part 1, *Thermodynamics* (six chapters, 135 pages) and Part 2, *Defect parameters* as a function of bulk properties, *i.e.* the $cB\Omega$ model (seven chapters, 258 pages); there are also 11 appendices on various post-deadline papers (22 pages), 674 references; a list of symbols; and an author and subject index. There are 122 figures, 63 tables and 757 equations. Part 1 defines and formulates thermodynamic functions and terms (including specific heats) for the formation and migration of vacancies, Schottky and Frenkel defects in isobaric and isochoric, perfect and imperfect crystals; it then presents the analysis of experiments yielding such defect parameters by X-ray and specific heat determinations, by self-diffusion, ionic conduction, and reorientation of dipole studies. Part 2 presents the connection between defect parameters and bulk properties for the isobaric and isochoric perfect crystal, and then demonstrates the authors' interpretation of experimental and theoretical results in terms of their $cB\Omega$ model: defect entropy and enthalpy for self-diffusion, defect volume and Gibbs energy, and temperature dependence of hetero-diffusion. Experimental and theoretical data on f.c.c., h.c.p., white tin and b.c.c. metals are given and evaluated, in addition to noble gas solids, pure as well as solid solutions of alkali and silver halides. In the last two chapters various empirical laws are interpreted and an extensive theoretical discussion and treatment of the $cB\Omega$ model is given in detail.

The authors not only present convincing arguments in favour of their $cB\Omega$ model but also demonstrate its apparent validity for many materials; however, among these selected examples there is not one semiconductor material (such as Si, Ge, SiC, GaAs, CdTe), and, except for β-tin, neither is there any (so-called) semi-metal (such as Ga, As, Sb, Bi, Te). There must be a simple reason for these omissions, which any footnote could have given.

Edge dislocations and respective crystal grain boundaries can be sources as well as sinks for vacancies or interstitials, as well as conduits for, or barriers to, diffusion. One could consider them thus as causing competing diffusion paths/sequences, and mechanisms, as well as giving rise to more than one activation energy, or even a prescribed energy distribution. The question is, then, whether the diffusion rates for (low dislocation) single crystals *versus* polycrystals differ from one another.

The reference list is very extensive; but I missed a reference to F. A. Kroger's book, *The chemistry of imperfect crystals*, which has treated point defects extensively. This, frankly, surprised me.

This is a good book; it is recommended for point-defect specialists regardless of their personal stance with respect to the specific issues involved, such as the $cB\Omega$ model. It is suited to any interested persons or students who are versed in differential calculus; after close and intensive reading of the text they will be versed in thermodynamics as well.

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