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Book Reviews

A to Z of Thermodynamics

Perrot, P. Oxford University Press: Oxford. ***1998****. vi+329 pp.*
Cloth: ISBN 0-19-856556-9, price: $*65.00.*
Paperback: ISBN 0-19-856552-6, price: $*29.95.*

This book is a dictionary or mini-encyclopaedia of thermodynamics. It is a novel idea and one that this reviewer finds both interesting and useful. The author has taken care to be rigorous, particularly with regards to the laws of thermodynamics, and to adhere to standard notation. There is a good amount of material devoted to mathematical principles as well as some interesting biographical material. The style of writing is, for the most part, succinct.

There are two generic items missing from this book that would have added to its utility: (1) a glossary of symbols and units, and (2) a modest bibliography or list of references of textbooks or treatises on thermodynamics. The inclusion of such a bibliography would have been particularly helpful if it was referenced appropriately in the various entries. Almost every reader will find some items missing that he or she feels should have been included. This reviewer noticed the absence of entries for the terms binding constant, (electric) charge, Faraday constant, massic, mean ionic, Legendre transform, molar mass, osmotic coefficient, relative quantity, and solubility. The only "serious" error that this reviewer found was on page 209 in an example involving the use of the Nernst equation to calculate the electromotive force of a cell. In that example, there were six electrons on the left side of the cell reaction. However the electromotive force of a cell is determined by the overall change in state. Therefore, the reaction as written in the book should have been balanced by the addition of $\{3H_2(g) = 6H^+(aq) + 6e^-\}$ so as to obtain a net reaction that did not contain any electrons. This properly balanced reaction leads to a different Nernst equation than the one given in the text.

But on the whole the strengths of the book far outweigh the errors and omissions. It is particularly strong on transport properties and on irreversible thermodynamics. This reviewer gleaned new information from the general definitions of conductivity and diffusivity. The text contains useful discussions of interesting chemical topics such as oscillating reactions (the Belousov–Zhabotinski reaction). The coverage of distribution laws (Boltzmann, Bose–Einstein, and Fermi–Dirac) and of ensembles and other terms used in statistical mechanics is quite good. Terminology pertinent to the description of phase behavior is also covered. The style of presentation is exemplary and reflects the author's views as given in the preface: "Simplicity and rigor are not necessarily synonymous with austerity, hence the small space allotted to matter that will prevent anyone dying a lunatic. Readers I hope will experience the pleasure I have felt when writing. Besides useful physico-mathematical developments, they will also find short etymological considerations,

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historical notes, and discussion of classic paradoxes or current topics, together with personal thoughts that sometimes go beyond the framework of the discipline."

This book will appeal to those who enjoy and practice thermodynamics. It should be particularly useful to those who are teaching thermodynamics or to anyone seeking clearly written definitions and clarification on a wide variety of thermodynamic topics.

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Structure and Thermodynamic Properties of Cryocrystals
Manzhelii, G.; Prokhvarilov, A. I.; Gavrilko, V. G.; Isakina, A. P.
Begell House: New York. **1999**. 319 pp. Price: $94.50.

Structure and Thermodynamic Properties of Cryocrystals is a handbook, summarizing available data on the structures, phases, phase diagrams, and thermal properties (vapor pressures, lattice parameters and thermal expansion, compressibility, sound velocity, heat capacity, thermal conductivity, magnetic susceptibility) of the simplest polyatomic cryocrystals, namely nitrogen, carbon monoxide, oxygen, fluorine, carbon dioxide, nitrogen monoxide, hydrogen sulphide, methane (including its deuterated isotopomers, CH_3D, CH_2D_2, CHD_3, and CD_4). Where data are not available, this is explicitly stated.

The materials discussed do not include rare gas solids (which are the simplest cryocrystals) since, as the authors point out, these have been considered in detail elsewhere. The authors also have decided not to include other simple molecular solids. For example, a similar treatment of structure and thermodynamic properties of the halomethanes would be very useful. However, this absence should not be taken as a criticism of this book, but a compliment because reading this book made me realize that similar treatment of other molecular solids would be very useful for researchers in this field.

The main reasons why this book is so useful are that the coverage is thorough, and the authors assess the data and present recommended values. In my opinion, only experienced researchers in an area can make assessments authoritatively, and this group of authors, from the Ukrainian Institute of Sciences, have the required expertise.

There are a few small ways in which this book could have been improved. It appears not to have been copy-edited by the publisher to correct spelling and wording errors which occur occasionally. Furthermore, although much of the older data is in calories, it would have been useful for the authors to present the data either in joules or in reduced units (*e.g.* in terms of R). Also, although this might only have been a problem with my copy, page 179 was in the wrong place (after page 199).

Notwithstanding these criticisms, which are minor detractions, this book is very useful, and I highly recommend it to those who are interested in the molecular solids presented therein. The price is reasonable enough to recommend its purchase for personal collections, as well as for libraries.

MARY ANNE WHITE

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