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Book Review

Thermochemical Data of Pure Substances, Parts I and II by I. Barin, published by VCH, Weinheim, Germany, ISBN 3-527-27812-5, 1739 pages; DM 680.

This two-volume, large-format tabular compilation lists in a very clear form the thermodynamic properties of almost 2400 pure substances, covering the elements and inorganic compounds with up to four elements, and also including approximately 100 important organic compounds (hydrocarbons, carbohydrates, etc). Most of the values listed are based on papers published in the 1960s and 1970s. The functional values have been listed for 100 K intervals, starting at 298.15 K; phase transitions can be easily identified. This book will be very useful in chemical thermodynamics and for those working in the fields of material science, process technology and chemical engineering. It is the most comprehensive volume of this kind published to date.

No evaluation or recommendation is made in the case of inconsistent source values, nor is this possible considering the large number of substances included. As far as they are available, critically evaluated data from suitable sources (CODATA, JANAF Tables) are used instead as a verified primary basis of the tables. This means that many values stem from measurements carried out decades ago.

Because complete sets of consistent basic data are lacking, values from sources of varying quality and from the author's own estimates had to be used for many substances to calculate the thermodynamic functions. This is especially true of the heat capacity $C_p(T)$ values. It is hardly possible in these cases to indicate fully reliable uncertainty values.

The units of the SI system are used throughout the book. IUPAC recommendations are generally followed. However, as has been frequently observed in the literature, the symbols recommended by IUPAC, for example $\Delta_f H$ for the enthalpy of formation, are not used (here, ΔH_f).

The introduction representing the thermodynamic functions and relations is followed by a section on the calculation of thermochemical functions. The structure of the tables is explained, and examples of their use are given in another very useful section, together with model calculations. The introductory part of the first volume is complemented by some important tables stating the fundamental constants (no reference given), conversion factors, the relative atomic masses of the elements (without reference), and a comprehensive index of the substances.

The structure of the tables is very clear. The functional values at 298.15 K

are indicated and the other values are stated in 100 K intervals starting at 300 K; the phase transition temperatures and the functional values of both phases are included. The tables cover the heat capacity, entropy, Gibbs energy function, enthalpy, enthalpy increment, Gibbs energy, standard enthalpy of formation, Gibbs standard enthalpy of formation, and the logarithm of the formation constant $K_f^{\ominus}$. Phase transition temperatures, entropies and enthalpies have also been included.

It would have been advisable to use the defining fixed points of the International Temperature Scale for the melting temperatures of some of the elements. It is also to be assumed that, for some values, optimum estimates are given somewhere in the literature, e.g. the heats of fusion of metals such as In, Bi, Sn, which are possibly difficult to find. However, considering the general concept, and the immense amounts of data and the usability of the values (at least as initial values), such individual aspects are of secondary importance.

It is suggested that tabular compilations of this scope in the age of computer technology should include the regression functions with which the values were calculated. This would save the user the trouble of carrying out interpolations of intermediate values which are, moreover, rather unreliable owing to the large intervals between the tabular values.

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