Short Notices

Research Techniques for High Pressure and High Temperature

Edited by G. C. Ulmer

Springer-Verlag, Berlin–Heidelberg–New York, 1971,
75 figs. xii + 367 pp, Cloth DM 33, - -,
US $10.30.

This is an invaluable handbook for those in the field of high pressures where rather little has been published on actual experimental methods (and hazards!). It also contains much of use to high temperature researchers particularly in its discussions of the difficulties of establishing equilibrium and on solid electrolyte gas sensors. On the high temperature side, however, temperatures above 2000°C are not discussed, whilst some of the comments on temperature control seem dated. Perhaps these, and other omissions, are due to the essentially geochemical and mineralogical point of view of almost all the contributors. Should a revised edition ever be mooted, some contribution from the fields of ceramics and semiconductors could improve the balance.

There are eleven contributions: "Gaseous Buffering for the Control of Oxygen Fugacity at One Atmosphere" by R. H. Nafziger (US Bureau of Mines), G. C. Ulmer (Temple University, Philadelphia) and E. Woermann (Inst. Kristallographie, Aachen), surveys theory and simple practice; however, "molecular sieves" for gas purification generally or palladium-silver diffusers for hydrogen are not mentioned, nor are solid electrolyte cells for monitoring oxygen fugacity. The last of course are discussed in the next chapter: "Electrochemical Measurements and Control of Oxygen Fugacity and Other Gaseous Fugacities with Solid Electrolyte Systems" by M. Sato (US Geological Survey), which runs to over 50 pages – a highly practical survey.

"Direct Control of the Oxygen Vapor Phase Mainly at Pressures Greater than One Atmosphere" by W. B. White (Dept. of Geochemistry and Mineralogy, Pennsylvania State University), is particularly useful for its discussion of operating details with internally and externally heated pressure vessels. "Buffering Techniques for Hydrostatic Systems at Elevated Pressures" by J. S. Huebner (US Geological Survey), which also runs to over 50 pages discusses the use of gas-solid reactions again with numerous practical details. "Temperature Calibration in Cold-Seal Pressure Vessels" by A. L. Boettcher, and D. M. Kerrick (Dept. of Geochemistry and Mineralogy, Pennsylvania State University) deals with temperature distributions and how they can be modified. "Pressure Calibration in Piston-Cylinder Apparatus at High Temperature" by P. M. Bell (Geophysical Lab., Carnegie Institute, Pittsburgh) and D. W. Williams (Electricity Council Research Centre, Capenhurst, England), largely deals with silicate phase equilibria and is the only section devoted entirely to the very high pressure range, above 10 kb.

"Internally Heated Pressure Vessels" by J. P. Holloway (Dept. of Chemistry, Arizona State University), reviews in painstaking detail the construction and operation of one particular 10 kb design (due to Professor Burnham of Pennsylvania State University). "Compressibility Measurements of Gases Using Externally Heated Pressure Vessels" by D. C. Presnall (Div. of Geosciences, University of Texas, Dallas), is another very practical article, with much constructional and operational data.

"The Boiling-Point Technique for the Determination of Vapor Pressure of Silicate Melts" by L. S. Walter (Planetology Branch, NASA), describes briefly a simple but somewhat crude technique for use with small samples. "Experimental Techniques in Dry Sulfide Research" by G. Kullerud (Geophysical Lab., Carnegie Institute, Pittsburgh), details a classic approach to mineralogical phase studies for materials with high decomposition pressures. "Investigations in Hydrothermal Sulfide Systems" by H. L. Barnes (Dept. of Geochemistry and Mineralogy, Pennsylvania State University), first discusses phase relationships, and goes on to their determination in practice – with particularly useful attention to hazards.

The book is reproduced from unjustified typewritten text (with not a few errors in it). The editor's hope that it will be cheap enough for students to buy has in part been frustrated by the decision to make it a hard-back volume. Can we hope for a significantly cheaper, revised, soft back edition soon?

C.H.L.

Properties of Polymers

D. W. Van Krevelen

Elsevier, Amsterdam, 1972. 427pp. Dfl 87.50. US $27.50.

This book describes methods for the estimation of properties of polymers when experimental data are not available. The range of properties covered is broad, including thermophysical, mechanical, optical, electrical, magnetic and transport properties. Because of the nature of the book there is also a large number of tabulations of existing data which are almost as useful as the estimation methods.

The treatment of topics can be divided into three classes. The properties for which good theoretically based correlations do exist, such as the thermophysical properties, are treated in the same way as in Bondi's "Physical properties of molecular crystals, liquids and glasses" and in Reid and Sherwood's "Properties of liquids and glasses". The discussion by Van Krevelen is less detailed than that by Bondi who also covered polymers, but since a much more limited range of compounds is covered – linear polymers only – this is probably acceptable. This less detailed treatment may have the disadvantage that the book will be of less use in less simple cases where the correlations may go wrong.

The second group of topics includes properties such as mechanical properties, where correlations are difficult to establish on a detailed scientific basis and are often established by drawing lines through rather wide bands of points. This collection of what are really rules-of-thumb have not been gathered together before to my knowledge, and should prove the most useful aspect of this book. These provide simple methods for crude estimates of a wide range of properties.

The final set of topics really provides little more than a short tabulation of data and a brief discussion such as would be found in most textbooks or better in Brandrup and Immergut's Polymer Handbook. Thus the sections on NMR and crystallization really just consist of a few basic formulae and short tables.

The book has a few unnecessary drawbacks. Data are presented seemingly in all possible combinations of units and it is often difficult to discover which set is relevant to any given equation. This is a particular disadvantage in a book that will be used piecemeal. Also different tabulations of mechanical properties give somewhat different values of moduli. Whilst this is not of crucial importance it does suggest that the author has not also had the time to be discriminating in the data he has included.

While the book contains no novel material and will probably become outdated quite rapidly, it provides a very useful source of estimating methods for a wide range of polymer properties and as such is a welcome publication.

P.D.C.

The University of Utah's annual Polymer Conference Series will be held in Salt Lake City, Utah from June 4 through July 20, 1973.
The fire programmes are: Fire Prevention and Control: Flammability Characteristics of Materials: Organic Coatings Technology: Mechanical Properties of Polymers: Adhesion: Polymers Crystallinity. Further information from The Director, Polymer Conference Series, College of Engineering, University of Utah, Salt Lake City 84112, U.S.A.