Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Macromolecular physics, Vol. 3: Crystal melting. By B. WUNDERLICH. Pp. xv + 363. London: Academic Press, 1980. Price £23.80, US $42.50.

Professor Wunderlich provides his own condensed description of his book in his preface in writing that he hopes this volume 'represents an attempt to reach a new level of summary of macromolecular physics on the basis of which further progress can be achieved'. This book is the third of a series on macromolecular physics. Volume 1 dealt with crystal structure, morphology and defects, while Volume 2 presented a summary on macromolecular crystal nucleation, growth and annealing. Volume 3 summarizes our present knowledge of the melting of linear, flexible macromolecules. The book is in three sections and goes from the topics of equilibrium to non-equilibrium and copolymer melting.

Section I deals with equilibrium melting and starts with the characterization of matter through its equilibrium melting behaviour. The equilibrium melting process is then presented in terms of general statements about melting and further discussed for the case of flexible linear macromolecules. The general problems of extrapolation to equilibrium data of flexible linear macromolecules are reviewed for volume and heat-capacity changes on melting, melting temperature and heat of fusion. A review on available experimental data follows. Changes in the equilibrium melting temperature as a function of molecular-weight distribution, pressure effects and diluent effects are presented and analysed. From this section it is clear that equilibrium melting of flexible linear macromolecules can give insight into the nature of molecules and phase structures.

Section II provides ways of recognizing irreversible melting. For the first time, experimental methods that can fix metastable structures long enough for investigation are reviewed. A selection of experimental information based on (*a*) crystals grown from solution, (*b*) crystals grown from the melt, (*c*) deformed crystals is presented. The final four chapters deal with some special topics: the melting at above zero-entropy production, melting temperatures occurring from superheating, the changes in the temperature of melting due to the effects of diluent or solvent; the observation of a local melting equilibrium at the surface, and the possible description of melting in single-phase systems.

Perhaps the most challenging part of this book is reached with section III where copolymer and isomer melting is treated. The first part deals with a necessary presentation of the chain structure and conformation in semi-crystalline copolymers and isomers. Next, an effort is made to discuss approximations to equilibrium melting. This incorporates attempts to describe phase diagrams mathematically as well as a discussion on some experimental approximations. Then the non-equilibrium melting of copolymers and isomeric macromolecular systems is presented following a classification in terms of random copolymers, regular copolymers and block copolymers. These sections incorporate the available experimental data. Finally, side-chain crystallization is treated as a special case of copolymer crystals.

Each section ends with references which are substantially complete through to the end of 1978. Both author and subject indexes are given at the end of the book. The book is carefully produced, fully illustrated and carefully proof-read. The author deserves the congratulations and gratitude of the polymer community for this major contribution.

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Computer processing of electron microscope images. Edited by P. W. HAWKES. Pp. vi + 296. Berlin, Heidelberg, New York: Springer-Verlag, 1980. Price DM 65.00, US $36.40.

This book is written by well known scientists, who are closely concerned with the actual problems of modern electron microscopy.

The subject of the first chapter (Hawkes) is the relationship between bright-field image and complex specimen transparency, and various techniques for exploiting it. Transfer functions for coherent and partially coherent illumination are introduced and described at a high mathematical level; numerous examples are given. Practical applications of the linear relationship are realized as: firstly, a straightforward method of establishing the microscope operating characteristics (C_s) and (Δ); secondly, setting the objective stigmator correctly in the case when the microscope image can be on-line controlled by computer; and thirdly (the most interesting), filtering members of a focal series to reconstruct phase and amplitude images with the best possible elimination of the deleterious effect of C_s and Δ.

The second chapter (Saxton: *Recovery of specimen information for strongly scattering objects*) is devoted to the problem of image correction for stronger objects, when the imaging process is non-linear. Two approaches are put forward: the first is based on an iterative application of the linear theory; the second is connected with twin intensity measurements. The theory is devoted to 'analytic' images, based on the constraint of a finite diffraction plane aperture. 'Holographic' methods dependent on the addition or removal of a reference beam are considered as well as 'ptychographic' methods in which neighbouring diffraction beams are made to overlap in such a way as to reveal their relative phases. A new non-iterative method is proposed, based on a bright–dark field subtraction, that allows a proper treatment of the coherence conditions.