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BOOK REVIEWS

Thermodynamics of Materials, Volume II. David V. Ragone, 242 pages, 98 figures, 3 tables, 35 references. John Wiley & Sons Inc. New York, Chichester, Brisbane, Toronto, Singapore (1995) Hardcover 60.-£ ISBN 0-471-30885-4 (v. 1)-ISBN 0-471-30886-2 (v. 2)

This book is a textbook for the second part of a two-course sequence at the undergraduate level on the physical chemistry of materials. Volume I deals with the law of thermodynamics, property relations, equilibrium, phase diagrams, and an introduction to statistical thermodynamics.

Chapter I of the presented Volume II reviews the principles of macroscopic thermodynamics, followed by chapters on statistical thermodynamics; defects in solids; surfaces and interfaces; diffusion; transformations such as diffusional, nucleation, and supercooling, followed by chapters on reaction kinetics and nonequilibrium thermodynamics.

The reader will appreciate the tables on characteristics of selected materials, values of selected physical constants, unit abbreviations, multiple and submultiple prefixes, and unit conversion factors.

This book is also of interest to scientists and engineers in polymer production and processing.

H. Domininghaus (Dreieich)

Polymer Physics. U.W. Gedde, X + 298 pages, Publication date: May 1995 Chapman & Hall, London, Hardcover 49.00 ISBN 0 412 590204, Paperback 24.99 ISBN 0 412 626403

Polymer Physics by Ulf. W. Gedde, is a teaching textbook on polymer physics. It gives a fundamental introduction and overview on the relevant properties of polymers, experimental methods and basic theories in this field of science. The book addresses graduate and undergraduate students and is suitable for a one semester course. As it contains a lot of exercises with their solutions attached in the final chapter it may be used for selfstudy as well.

Each chapter has an introduction and a summary. A brief introduction to polymer science, including fundamental definitions, basic polymer chemistry and a historical perspective are covered in an introductory chapter. The main part of the book then focuses on the different physical states and phenomena which are characteristic of polymers as well as on the basic theories used to explain them. The experimental techniques used to study polymeric systems are described.

This valuable book is ideal for those who wish to get a brief background in polymer science as well as for those who seek a further grounding in the subject.

Th. Fischer (Leipzig)

Adhesion Measurement of Films and Coatings. by K.L. Mittal (ed) X + 456 pages, 263 figures, 50 tables, 692 references. VSP, Utrecht (1995) Hardcover 147.-DM ISBN 90-6764-182-0

The book embodies the proceedings of the International Symposium on Adhesion Measurement of Films and Coatings (Boston 1992). The articles were previously published in three special issues of the *Journal of Adhesion Science and Technology*.

Preliminarily, the editor defines some fundamental terms and tries to give a summary of the numerous measurement techniques. The following 27 contributions consist of overview papers as well as original research results. There are many hints to the unresolved problems in adhesion measurements: the locus of coating-substrate failure, the confusion in comparing the results given in different dimensions, the influence of environmental factors, of the surface structure of the substrate, of the experimental parameters etc.. Special systems of practical importance (e.g. TiN, diamond, paint, ceramic or polymer films/coatings on different substrates) were investigated by traditional (peel, pull, scratch, indentation test) as well as novel methods such as for instance the use of surface acoustic waves. However, the techniques for direct measurement of the interaction forces on molecular level are missing. Numerous diagrams, schemes and tables serve as a good illustration.

The adhesion of films and coatings to the underlying substrates is of cardinal importance for practical application. The book provides a lot of information especially for technologists and engineers interested in measuring adhesion of films and coatings.

U.-C. Boehnke (Leipzig)

Dynamic Kerr Effect
J.L. Dejardin 1995. World Scientific Series in Contemporary Chemical Physics, Vol. 7, 234 pages. World Scientific, Singapore, Price: hardcover, £ 36.00.

This primarily theoretically oriented book summarizes the state-of-the art of an old but still actual spectroscopic technique, the Dynamic Kerr Effect. In introductory chapters the general forms of diffusion equations and the analysis of rotational molecular motion in Kerr effect relaxation is outlined. Based on this the Kerr effect in alternating electric fields is discussed and formulas for the influence of a strong dc field being superimposed on a weak ac field are developed. Special emphasis is given to the influence of molecular rotational inertia on the electric birefringence in the Kerr effect and on the nonlinear response in dielectric relaxation. Briefly the experimental methods are described, such as multireflection cells, the detection sensitivity and the application of Kramers–Kronig relations to electric birefringence. The book is highly recommended as textbook for graduate students, but as well as monograph for spectrocopists who are interested in the Dynamic Kerr Effect.

F. Kremer (Leipzig)

Femtosecond Chemistry
J. Manz, L. Wöste (eds) 1995. 916 pages, 365 figures, 15 tables. Vett, Weinheim. Price: DM 398.

"Femtosecond Chemistry" consists of two volumes with 27 chapters on about 1000 pages. The purpose of the book is to furnish an in-depth introduction to femtosecond chemistry, covering the fundamentals and wide ranging applications. The 27 chapters are combined in five parts, each chapter is written by experts in the particular fields. In part I "femtosecond chemistry: from flash photolysis to femtochemistry" Lord G. Porter presents an overview on the historical development in temporal resolution of chemical processes. A.H. Zewail gives in his chapter a fundamental survey of the development and status of the subject including numerous applications. Part II "simple systems: molecules" presents the experimental and theoretical development of the field for small molecules. Here P.P. Sorokin, J.H. Glownia and co-workers give the experimental scheme which allowed them to perform broadband absorption spectroscopy and real-time probing of photoinitiated unimolecular reactions. J.L. Knee describes pump-probe photoelectron spectroscopy experiments for investigation of the vibrational dynamics and photodissociation of weakly bound complexes. P.M. Felker and A.H. Zewail show the potential of ultrafast coherent spectroscopy for obtaining structural information, ranging from small molecules to complex systems. The next two chapters, written by A.D. Bandrauk and S.-Y. Lee present the theoretical fundamentals of molecules in intense laser fields and the modelling of pump-probe experiments. They are followed

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by two chapters of R. Schinke/J.R. Huber and Ch. Meier/V. Engel about applications of wave-packet dynamics. Developments in photodissociative processes are presented by M. Shapiro and B.R. Johnson and in a further chapter by J.L. Kinsey. Part III "from simple to complex systems: clusters" starts with a chapter by T. Baumert, G. Gerber and co-workers presenting a series of time-resolved experiments on Na aggregates of increasing size. B. Soap et al. report on time-resolved studies of van der Waals-bonded mercury-rare-gas aggregates. Experiments on Hydrogen-bonded cluster systems are presented by A.W. Castleman et al. J.A. Syage is in his chapter concerned with the chemical dynamics commonly attributed to clusters. The next two chapters, written by R.B. Gerber, A.B. McCoy, A. Garcia-Vela and N.P. Blake, H. Metiu, present theoretical treatments of the phenomena occurring in clusters. Part IV "complex systems: liquids, solids, surfaces and photosynthetic reaction centers" demonstrates the path from simple molecules to more complex systems as liquids (T. Elsaesser), solids (Y. Siegal, E. Glezer and E. Mazur), surfaces (J.W. Gadzuk) and photosynthesis (G. Porter, S.H. Lin). Part V "new direction in femtosecond chemistry: wave-packet control, and outlook" treats wavepacket control and offers an outlook on future laser controlled chemical reactions. These chapters are written by G.K. Paramonov, M. Holthaus, A.D. Bandrauk/E. Aubanel/S. Chelkowski and K.R. Wilson. The book closes with a chapter of M. Quack, giving an overview of chemical processes ranging on timescales between femtoseconds and several days. As a summary it can be stated that the book not only gives an introduction and overview on the fast developing field of femtosecond chemistry. The thorough treatment of theoretical and experimental aspects and the detailed and up-dated reference list makes it useful as a textbook as well as a reference work for researchers already familiar with the subject.

Herbert Groothues (Leipzig)

A.Ya. Gol'dman: Prediction of the Properties of Polymeric and Composite Materials, translated and edited by M. Shelef and R.A. Dickie. 349 pages, 174 figures, 23 tables, 358 references. American Chemistry Society Washington DC 1994. Hardcover 59, 95 US$ (ISBN 0-8412-2504-4)

The prediction of creep and long-term strength of composite materials is amply justified. Nevertheless some failures of structural elements are due to computional inadequacies and the poor reliability of creep and long-term strength predictions. Therefore time-consuming and expensive testing of structural elements at working conditions is widely practiced for periods commensurate with the intended service life. This necessity explains the importance of the predictive methods for long-term material strength, which enable long-term deformability and strength under conditions of complex stress to be assessed on the basis of limited-time testing.

This monograph describes the principles for predicting the deformability and strength of polymeric and composite materials on the basis of intensification and acceleration of relaxation and failure processes by such factors as: temperature, pressure, stress and loading methods. In addition to superposition methods, the book considers the method of equivalent damage and failure. The utility of quasi-static test methods using standard testing machines is considered. The book also treats the prediction of deformation properties under the complex stress states prevalent in real structures. It generalizises the basic experimental and theoretical results of several classes of polymeric materials: thermoplastic amorphous and semi crystalline polymer, thermosettings, elastomers, composites, blends and multicomponent systems. The traditional mechanical properties obtained under simplest loads are insufficient for prediction and computation of the usefulness of polymeric materials under the extreme conditions of their use. Therefore the monograph tests the issue of predicting deformation properties under uniaxial, bi- and triaxial; stresses. This factual material will be a great help to engineers and material specialists.

H. Domininghaus (Dreieich)

A.L. Bisio and M. Xanthos (eds.): How to Manage Plastics Waste. 272 pages, 11 figures, 44 tables, 889 references. Hanser Publishers, Munich, Vienna, New York, 1994. Hanser/Gardner Publications, Inc. Cincinnati, Hardcover: DM 98, -/ÖS 765, -/US$ 62, 50/£ 37,50 (ISBN 3-446-17751-5)

This book relates to the state of plastics waste management in the USA. The US Government and many state governments are promoting the expansion of current programs and the initiation of new ones. The studies summarized in this book were conducted during 1991 and 1993 supported by the US Department of Energy under contract to the Polymer Processing Institute, Hoboken/NJ utilizing the talents of participants from industrial companies, government agencies, and research institutes.

The first of the four parts gives an overview of critical waste streams and the technology of polymer recovery/recycling and the potential for energy savings. The second part covers developments and assesments of recovery technologies such as sortation, wash/float separation, micro sortation and solvent separation. Part three deals with the recycling technologies such as melt reprocessing of thermoplastics and generic thermosets, commingled polymers and solvolysis of PS, PET and PUR followed by pyrolytic processes and the important domain of modification and compatibilization of polymers. The fourth chapter presents the research needs as well as the market and business opportunities and economic issues.

This book will assist those in industry, universities and government who are already undertaking some of the needed tasks.

H. Domininghaus (Dreieich)

S.F. Sun: Physical Chemistry of Macromolecules. Basic Principles and Issues. 469 pages, 154 figures, 21 tables, 341 references John Wiley & Sons Inc. (1994) New York, Chichester, Brisbane, Toronto, Singapore Hard cover $ 54, -/US £ 80, 50 (ISBN 0-471-59788-0)

It's the goal of this book to unite the topic physical chemistry of macro molecules offered so far in the courses of biochemistry as well as in chemistry but limited on the particular interests of each discipline into one by providing readers with the basic knowledge of both. After an introduction to colloids and macromolecules (Synthetic and biological) the second chapter deals with the synthesis of macromolecular compounds. The following chapter talks about the distribution of molecular weight. In chapter 4 the basic thermodynamic concepts of Flory and Gennes are introduced followed by the mainly experimental studies of macromolecules such as chain configuration (5), viscosity and viscoelasticity (6) and osmotic pressure (7). Chapters 8 through 12 are intermingled in content but they are important that each can be an independent one:

Light scattering (8), small-angle X-ray scattering and neutron scattering (9), diffusion (10), dynamic light scattering (11) and sedimentation (12). Chapters 13 through 17 describe some of the important experimental techniques that were not covered in chapters 6 through 12. Chapter 13 an optical rotary dispersion (ORD) and circular dichroism (CD) describes the content of helices in a biological polymer in its native as well as in its denatured state. Chapter 14 provides basic knowledge of nuclear magnetic resonance phenomena.

Chapters on X-ray crystallography (15), electronic and infrared spectroscopy (16) and high performance, liquid chromatography and electrophoresis (17) follow.

At the end of each chapter references and homework problems are designed to help readers clarify certain points in the text.

This book will be an appreciated help to graduate and post-graduate students as well as to teaching scientists.

H. Domininghaus (Dreieich)