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Book reviews

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Book Reviews†

Frontiers of Polymer Research, edited by Paras N. Prasad and Jai K. Nigam, Plenum Press, New York and London, 1991; ISBN 0-306-44096-2; xi + 628 pages; $129.50.

This book contains the proceedings of the First International Conference on Frontiers of Polymer Research held in New Delhi, India, January 20–25, 1991. The book consists of an introductory chapter by Prasad followed by three major sections. The first, Polymers for Photonics, consists of 23 chapters and deals with both nonlinear optical properties and polymeric optical fibers. The second, Polymers for Electronics, consists of 27 chapters mostly concerning electronically conductive polymers although some attention is devoted to relatively mature topics such as piezoelectric polymers and polymers in electrophotography. The third section, High Performance Polymers (19 chapters), deals mostly in recent developments in rigid rod and liquid crystalline polymers but contains more mature materials such as polystyrene and polybutadiene. The subject index is 8 pages, and the book is dedicated to the memory of the late Donald R. Ulrich of the U.S. Air Force Office of Scientific Research.

† Unsigned book reviews are by the Book Review Editor.

Fullerenes: Synthesis, Properties, and Chemistry of Large Carbon Clusters, edited by George S. Hammond and Valerie J. Kuck, American Chemical Society, Washington, D.C., 1992. (ACS Symposium Series No. 481); ix + 196 pages; ISBN-0-8412-2182-0; $44.95.

This book was developed from a Fast Breaking Events Symposium held at the ACS National Meeting in Atlanta, GA during April 1991. As stated in the preface, the editors' intent is to present the results and ideas of scientists working in the fast-paced area of fullerene research during the year following the first synthesis of macroscopic quantities of C_{60}.

An overview briefly describes the early history of fullerenes and the excitement generated in the scientific community by the discovery of these new allotropic forms of carbon. Chapters and/or sections of the book are summarized in the overview, which ends with speculation by the editor on the future of fullerenes.

The book consists of 12 chapters. Chapter 1 begins appropriately with the presentation of a model based on experiment and ab intio theory for the formation of fullerenes via the carbon-arc method. The remaining chapters can be divided into three major areas: (1) structural studies of C_{60} and derivatives using techniques such as x-ray and electron diffraction, NMR, IR and Raman spectroscopy; (2)

mass spectrometry and thermal properties of fullerenes and doped fullerenes; and (3) chemical behavior of fullerenes—inorganic (superconductors), organic, and organometallic. In the chapter on doped fullerenes interesting new nomenclature is proposed to distinguish those doped with metal atoms inside, outside, and on the fullerene spheroid.

This book can be recommended to those interested in the structural characterization of fullerenes and a description of the first derivatives of C_{60}. While the rapid pace of events in fullerene research continues, this volume contains information that will be useful for years to come. Royalties will be donated to Project Seed which provides funds for economically disadvantaged high school students to do research in an industrial or academic laboratory.

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Lower-Dimensional Systems and Molecular Electronics, edited by Robert M. Metzger, Peter Day and George C. Papavassiliou, NATO ASI SERIES B, Vol. 248; Plenum Press, New York and London, 1990; ISBN 0-306-43826-7; xiv + 742 pages; $149.50.

This book contains the proceedings of a NATO Advanced Study Institute on Lower-Dimensional Systems and Molecular Electronics, held June 12–23, 1989 on Spetses Island, Greece. The book consists of 78 chapters summarizing plenary lectures (PL) and communications (C) on various topics, a list of participants and author and subject indices. The topics and number of contributions are as follows: Charge-Transfer Compounds (PL, 2); Ion-Radical Salts and Superconductors (PL, 8; C, 17); Inorganic Lower-Dimensional Systems (C, 5); Conducting Polymers (PL, 5; C, 14); Theory (C, 5); Langmuir-Blodgett Films (PL, 4; C, 6); Non-Linear Optics (PL, 4; C, 1); Molecular Devices (PL, 1; C, 6).

At least two of the chapters merit some comment. The PL by A. J. Heeger makes the useful classification of conductive, heavily doped polymers into two types: "dirty" conductors and true metals. R. M. Metzger's communication "Prospects for Truly Unimolecular Devices" is a useful summary of the background of that subject up to the time of the Institute.

The Chemical Bond: Structure and Dynamics, edited by Ahmed Zewail; Academic Press, 1992; xv + 313 pages; ISBN 0-12-779620-7; $49.95.

This book resulted from a symposium held on the occasion of Linus Pauling's ninetieth birthday in the year of the centennial celebration of the California Institute

of Technology. Even if he were not a "scientific grandson" of Pauling, the Book Review Editor could enthusiastically encourage both students and experienced researchers to read and enjoy this fascinating book. The authors (Pauling, Max F. Perutz, Alexander Rich, Francis Crick, George Porter, John C. Polanyi, Dudley R. Herschbach, Ahmed Zeqail and Richard B. Bernstein) are obviously the who's who of structure and dynamics in chemistry and molecular biology. They perform their assigned task of highlighting past achievements and outlining future directions admirably well; their personal reminiscences will be of interest to students in that they outline how "science is done".

Readers will find Pauling's two chapters on the chemical bond particularly interesting. He appears to reach the conclusion that modern computing power is a mixed blessing in that it requires less thinking on the part of the crystallographer than was necessary in the early days. Pauling also details his "conservative" view concerning the experimental evidence that icosahedral quasicrystals might be the result of twinning of crystals with conventional point group symmetry. Dudley Herschbach's reminiscences of his early meetings with Pauling and of the mind set of physical chemists when confronted with results obtained from emerging experimental techniques also make interesting reading.

Direct Methods of Solving Crystal Structures, edited by H. Schenk; Plenum Press, New York and London, 1991; NATO ASI Series B, Physics, Vol. 274; ISBN 0-306-44040-7; ix + 445 pages; $115.00.

This book is the proceedings of a NATO Advanced Study Institute: 18th Course of the International School of Crystallography on Direct Methods of Solving Crystal Structures, held April 18–29, 1990 in Erice, Sicily, Italy. The meeting in Erice was the tenth institute on direct methods. The book consists of an introductory chapter on direct methods by the editor, an additional 46 chapters, and a five page subject index. Leading investigators who contributed to the book include H. A. Hauptman, D. Sayre, and M. M. Woolfson.

Condensed Systems of Low Dimesionality, edited by J. L. Beeby, NATO ASI Series B: Physics Vol. 253; Plenum Press, New York and London, 1991; xiv + 830 pages; $155.00; ISBN 0-30643887-9.

This book contains the proceedings of a NATO Advanced Research Workshop on Condensed Systems of Low Dimensionality, held April 23-27, 1990 in Marmaris, Turkey. The major focus of the book is on semiconductor quantum wells and other structures of reduced dimensionality. The sections of primary interest to readers of this journal deal with Layered Compounds and Low Dimensional Structures. The latter section has an article by D. Jerome on Low Dimensional Molecular Conductors, an article on theoretical aspects of Low Dimensional Organic Struc-

tures by B. Movaghar, and three articles on various aspects of optical and electronic phenomena in Langmuir-Blodgett films by A. Barraud and M. Vandevyver, R. M. Metzger and C. A. Panetta, and H. Kuhn. A six page subject index is included.

Optical Effects in Liquid Crystals, edited by Istvan Janossy. Kluwer Academic Publishers, 1991, 232 pp. $99. ISBN 0-7923-1277-5.

As Volume 5 of Kluwer's Reprint Series: *Perspectives in Condensed Matter Physics*, this book does a commendable job of fulfilling the aims of the series in providing an introduction, in this case, to optical effects in liquid crystals, together with a critical selection of reprints. Although the emphasis is primarily on nonlinear optics of liquid crystals, linear optics is also discussed in considerable detail.

The book consists of an introductory chapter by Janossy, followed by 28 articles reprinted from journals. The introduction covers basic properties of liquid crystals, light propagation, harmonic generation, optical reorientation and thermo-optic effects. This chapter is generally well written, providing clear explanations of subtle effects. These include the anomalous thresholds observed for the optical Freedericksz transition associated with 'adiabatic' propagation, and the absence of second harmonic generation in cholesterics due to Kleinman symmetry. Janossy also gives a very readable account of the history of developments in the field.

The collection of reprints is interesting. The first four are seminal papers in linear optics; the first two dealing with optical properties of cholesterics, and the second two with light propagation in anisotropic stratified media. Of the remaining 24 papers, four deal with harmonic generation, and the rest essentially with optical field induced reorientation and thermal effects. The selected papers are important, and clearly deserve attention. The absence of papers published after 1988 is somewhat surprising, however, as is the strong emphasis on director reorientation. Examples of more recent work, such as the study of nonlinearities on shorter timescales, would have been welcome.

Locating papers cited in the introduction is somewhat awkward; one first has to go to the end of the chapter to find the reference, then to the table of contents where one has to search by author. For some reason here the volume numbers of the journals are omitted.

The price is rather high for a book consisting primarily of reprints from the literature, and this could well put it out of the reach of many of the graduate students and junior researchers for whom it is primarily intended. My copy suffered from poor print quality, even in the obviously typeset portions of the book. Even with these shortcomings, however, this book is valuable in providing a very useful summary of key contributions in the area of optical effects in liquid crystals.

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