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BOOK REVIEW

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Electronic Processes in Organic Crystal and Polymers by Martin Pope and Charles E. Swenberg, Oxford University Press, New York, Oxford, 1999; ISBN 0-19-512963-6; xxix + 1328 pages; $285.00.

Given the considerable explosion of information concerning electronic and optical processes in organic crystals and more recently in conjugated polymers, an updating of the first edition of Pope and Swenberg is a major task. The authors attacked the task by reprinting the first edition and adding sixteen chapters (Part II). The titles of the latter are: Electronic Processes in Polyacetylene, Electronic Processes in Polydiacetylene(PDA), Electronic Processes in Poly(*p*-Phenylenevinylene) (PPV), Electronic Processes in Polyaniline (PAni), Electronic Processes in Polysilane (PS), Electronic Processes in Fullerenes, Carrier Generation and Recombination, Carrier Transport, Space-Charge and Emission-Limited Currents, Organic Magnets, Superconductivity and Other Collective States, Nonlinear Optical and Photorefractive Properties (NLO), Molecular Electronics, and Applications.

The authors continue the philosophy of their first edition, namely to select and treat a limited number of topics to serve as a basis for further reading and understanding and not to attempt a comprehensive review of the subjects. With certain exceptions, they have given an in-depth treatment of virtually all of the subjects and materials that have emerged in recent years. This is the great strength of the book, and these areas will be valuable to readers for the forseeable future.

Yet, the authors have not updated mistakes in the first edition. On p. 673, the authors state that both acetylenic and butatrienic forms of PDA have been observed. To date, no PDA has been found with a butatriene structure. In addition, from ab initio calculations of Alfred Karpfen, the butatriene form is considerably higher in energy than the acetylenic form. Karpfen's work is not cited in the book. On p. 600 ff., the authors fail to note that NMP-TCNQ and all of its variants are decomposed ill-defined materials.

In the second edition, the authors do not serve the reader well by failing to cite several important reviews and summaries. The first edition of the "Handbook of Conducting Polymers" is not cited. Nalwa's review of

the third order nonlinear optical properties is also not found. While the original references are given, don't look for the Su-Schrieffer-Heeger review of solitons in polyacetylene.

There are significant problems with several topics in Part II. The chapter on ferromagnetism lacks perspective. The work on organic metals achieved acceptance by the physics community because of the rigorous purification of the materials pioneered by A.F. Garito and A.J. Heeger. No such effort has been put into the magnetic materials. From p. 1043, it is apparent that the materials termed $[V(TCNE)_x][y(CH_2Cl_2)]$ are ill-defined. For some reason, the authors describe these materials as crystalline.

The term "conjugation length" is central to discussions of linear and nonlinear optical properties of conjugated polymers. There is no meaningful, in depth discussion of the topic in the book.

The sections on nonlinear optics have significant shortcomings. The most detailed studies of second order properties are those of A.F. Garito and coworkers on MNA. This work is not cited. A topic such as optical limiting is not discussed.

The Aviram-Ratner model of molecular rectification requires a D-σ-A molecule. The authors describe work on D-π-A system as supporting the Aviram-Ratner model; the system studied cannot possibly be a meaningful system for such purposes.

In the preface to the first edition, the authors state that their philosophy in preparing the book was shaped by Mott and Gurney's "Electronic Processes in Ionic Solids." While it is readily apparent that quantum mechanics provides a framework for discussion of both inorganic and organic solids, the present book, despite its considerable strengths, will not have the longevity of a book such as the Mott and Gurney work because of the numerous shortcomings cited above.

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