Organic Conductors, Fibers, Thin Films...

One-Dimensional Conductors. (Springer Series in Solid State Science 72.) By *S. Kagoshima, H. Nagasawa* and *T. Sambongi*. Springer-Verlag Berlin 1988. xii, 235 pp., hard cover, DM 99.—ISBN 3-540-18154-7

This volume is a very good introduction to the physics and electronic properties of one-dimensional conductors. After a brief introduction describing the features of one-dimensional conductors the basic theoretical aspects of a one-dimensional electron system are explained. Thus the important concepts of the one-dimensional conduction band, the Peierls instability and transition, the electron-phonon coupling and Kohn anomaly, the nesting of the Fermi surface, charge density waves, fluctuations in one dimension, and the role of the Coulomb interaction are described and discussed. In addition, a comparison of the conditions in two and three dimensions is made. This chapter serves as an excellent introduction to the field for graduate and undergraduate students of physics and chemistry, as well as for researchers in other fields of solid state physics.

In Chapters III to VII the chemical and physical properties of typical one-dimensional conductors are reviewed. The review starts with TTF-TCNQ and related materials, giving a reasonably complete survey of their properties, starting with crystal growth, followed by the electrical and magnetic properties and the behavior of the charge density wave. This part is important because it was in crystals of TTF-TCNQ that more or less all the typical one-dimensional phenomena were first experimentally observed. In addition, this chapter contains descriptions of the properties of some other TTF salts, as well as of the Bechgaard salts $(TMTSF)_2X$. For the latter in particular the superconducting properties of the $(TMTSF)_2PF_6$ and $(TMTSF)_2AsF_6$ salts under pressure are explained. The superconductivity at ambient pressure in $(TMTSF)_2ClO_4$ is mentioned only briefly, and the properties of the many important BEDT-TTF radical salts discovered since 1982 are discussed only on one page, giving some cause for criticism. The original text was written in 1981 in Japan and printed there in 1982. The review on the various materials is therefore more or less complete up to 1980. In the preface the authors mention that in rewriting the volume for the Springer Series in Solid State Science they revised the contents and updated each chapter in the light of recent developments in this field. The updating of all the chapters is, however, by far too short and incomplete, so that in all cases the newest ideas and developments in the field are more or less lacking. In this sense the contents of the volume unfortunately do not represent the "state of the art".

In Chapters IV and V the properties of the inorganic materials MX_3 ($NbSe_3$, TaS_3, $TaSe_3$ etc.) and of the Krogmann salts KCP are described, with an emphasis on the important concept of charge density waves. The optical and magnetic properties, as well as some structural aspects of one-dimensional systems, are also discussed with an account of some experimental results. In the next very short chapter the properties of the linear chain polymers $(CH)_x$ and $(SN)_x$ are presented. Here again the latest experimental results and theoretical ideas on polyacetylene are missing, but the reader is certainly introduced to the problems, and especially to the concept of solitons in polymers. In the last chapter the synthesis, structure, conductivity and superconductivity of the linear chain mercury compounds are discussed.

Despite some criticism, mainly regarding the scant coverage of experimental results since 1980, the volume certainly achieves its aim of providing an introduction to the field of one-dimensional conductors, and it was high time that such a survey was written.

Dieter Schweitzer
Max-Planck-Institut für Medizinische Forschung
Heidelberg (FRG)

Graphite Fibers and Filaments. Springer Series in Materials Science, Vol. 5. By *M. S. Dresselhaus, G. Dresselhaus, K. Sugihara, I. L. Spain* and *H. A. Goldberg*. Springer, Berlin/Heidelberg 1988. x, 382 pp., hard cover, DM 122.00.—ISBN 3-540-18938-6

News of the publication of "Graphite Fibers and Filaments" might lead one to ask whether it is really necessary or desirable to add yet another volume to the already existing monographs and review articles on carbon fibers. However, after looking more closely through the contents of this book one can answer yes to the question. One important reason is the topicality of this progress report, as the whole field is certainly still undergoing rapid development; an additional reason of even more crucial importance is that the book concentrates on the physical properties of the fibers.

The idea of writing this book arose at a specialist conference, and the names of the team of authors, from MIT, Colorado State University and Hoechst Celanese, were a guarantee that the material would be competently covered. In doing so the authors have not hesitated to include their original contributions to fill gaps in the literature that became apparent.

Following a brief description of the existing types of fibers, their manufacture is treated in the second chapter. The synthesis of the types of carbon fibers derived from rayon, polyacrylonitrile and mesophase pitch as precursors is briefly covered. More space is given to the preparation and the mechanism of growth of carbon filaments produced by