ADVANCED MATERIALS

Molecular Crystals and Solid State Chemistry

Molecular Crystals. By *J. D. Wright*. Cambridge University Press, Cambridge 1987. VIII, 178 pp., bound, £ 32.50.—ISBN 0-542-26460

Twenty years ago the three volumes entitled "Physics and Chemistry of the Organic Solid State", edited by *Fox, Labes* and *Weissberger* and published between 1963 and 1967 provided an excellent introduction to the subject, which was then covered by some 30 authors in 26 chapters, encompassing more than 2300 pages. The series was as successful as such books can be, and many of the chapters are still well worth reading. Since then the subject has grown enormously; some of the then existing areas have been developed beyond anything that could have been foreseen: crystal growth, the effect of solvents and impurities on crystal morphology, organic solid-state reactions, to name only a few. At the same time important new areas have been added: force field calculations and lattice dynamics (made possible by computer developments), organic metals and superconductors, second-harmonic generators, the study of molecular motion in crystals by solid-state NMR as well as diffraction methods. Also, since the mid-60s the number of molecular crystal structures available, so to say, for detailed scrutiny has increased from around 2000 to more than 70000.

As Dr. *Wright* correctly points out in his preface, there is a serious gap in the teaching of this subject in that most of the current solid-state chemistry and physics textbooks scarcely mention molecular crystals. There are excellent advanced texts covering limited areas, but apart from their specialized coverage they tend to be difficult for newcomers.

In this book, Dr. *Wright* has made a brave attempt to cover the whole subject, single-handed, in less than 180 pages. There are short chapters on purification and crystal growth (10 pages), intermolecular forces (9 pages), crystal structures (12 pages), impurities and defects (24 pages), molecular motion in crystals (22 pages), optical properties of molecular crystals (20 pages), chemical reactions in molecular crystals (23 pages), and, finally, electrical properties (the pièce de résistance with 46 pages). The author whisks us briskly through all these topics, in one door, out of another, and it is all a little like being taken on a ten-minute tour of the Louvre. Thus the book does provide an overall impression of the richness and variety of the subject matter. There are many illuminating explanations and comments, as well as a few slips and other mishaps, but the pace is so breathtaking that they do not really matter. On almost every topic, the beginner is likely to be dazed as much as enlightened, and the research worker will find the treatment far too superficial for his needs.

As an example, take the chapter on crystal structures. Dr. *Wright* considers a few very simple structures out of the 70000 available and has some sensible things to say about them. But he gives the impression that a classification of molecular crystal structures into three groups (nonpolar molecules, molecules with polar substituents, and intermolecular donor-acceptor or charge-transfer complexes) provides genuine insight into the complexity of this enormously intricate subject. Such a classification could at best serve as a basis for defining three special types of interaction that could be invoked in the discussion of crystal structures, but in the vast majority of actual structures all three types of interaction come into play. We are still very far from an understanding of why particular molecules crystallize as they do. We may understand the general principles, but there are far too many details. It is true that when energy calculations based on fairly simple types of force field are made for an *observed crystal structure*, they usually produce an energy minimum at or close to the structure in question, but they give no hint of what other molecular arrangements may be possible. Nearly all the structures discussed here are built from planar aromatic molecules, a very small sample of the real, messy world. More stereodiagrams (I found only one) would have helped the reader, in this chapter and in others, to visualize the three-dimensional packing of the molecules.

In my opinion, Dr. *Wright* has undertaken a hopeless task in his effort to provide an elementary textbook on molecular crystals in such a short book. Perhaps it is the publishers who are to be blamed for imposing this limitation (as well as for the price, which will surely drive much of the prospective readership to the photocopier). Solid-state NMR in less than five pages! Lattice dynamics in three! It is difficult to see how a student can benefit from such superficial coverage. Many of the topics that are compressed here into a few pages would take an entire book to do them justice. His publishers should encourage him to expand one or two of his chapters into such a book. That would be a really worthwhile venture!

Organic Solid State Chemistry. Edited by *G. R. Desiraju*. Elsevier Science Publishers, Amsterdam 1987. xx, 550 pp., hard cover, Hfl 360.00.—ISBN 0-444-42844-5

This book is a collection of 14 review articles that describe developments in solid state chemistry during the last two decades. First a description of the contents: The book opens with five chapters on "Organic solid state reactions: topochemistry and mechanism". The reactions discussed are mainly photochemical intramolecular hydrogen abstractions *(Scheffer)* and [2+2] additions *(Theocharis* and *Jones*, and *Hasegawa)*, there is a chapter on the prediction of reactivity using geometric criteria *(Kearsley)* and one on phonon spectroscopy *(Prasad)*. The middle section consists of four chapters on the theme "Some stereochemical questions: pure and applied chemistry". *J. M. Thomas* and *Harris* discuss experimental and computational techniques for studying the structure and properties of molecules em-