Molecular Crystals and Liquid Crystals

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Organic Molecular Solids

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Book Review

Organic Molecular Solids, by Markus Schwoerer and Hans Christoph Wolf; Wiley-VCH, Weinheim, 2007; ISBN: 978-2-527-40540-4(paper); xi + 427 pp; $95.

There are very few books that deal with the chemistry or physics of organic solids. Most relevant are those that treat molecular solids but these often involve much attention to crystals of noble gases and do not usually focus upon the peculiarities that make organic solids such a fascinating area of research. This book, a translation from the original German publication, is the product of the effort by two very well-known researchers in the area of organic crystals. Schwoerer and Wolf are chemical physicists whose book is aimed at addressing the interesting physical properties of organic molecular crystals. The main intended audience is students interested in the topic but "[. . .]it is [also] intended for all physicists, photochemists, and perhaps also chemists [. . .]" The book assumes a good basic knowledge of solid-state physics which is probably the reason "perhaps" is found in the last phrase.

The 427-page book is well designed and well produced. The translation is quite readable, and the illustrations are not only executed well but useful pedagogically. The index is useful and reasonably complete. A compound index and perhaps an author index would have also been useful.

Topics addressed are the forces that bind organic crystals, purity of materials and crystal growth, defects, lattice dynamics, electronic states and excitons, triplet states, charge transport and conductivity, electroluminescence, photovoltaic effect, and the potential for molecular electronics. Some attention is also given to organic films. Charge transfer crystals are extensively treated but a significant omission is the neutral-ionic phase transition in mixed-stack systems. There is a natural emphasis on the authors' research interests. The book begins with a nice sampling of exercises in the early chapters but their number significantly diminish with progress through the text. The topics and references, rather self-referential, suffer from the text being originally directed toward a German-language readership and give the impression that the bulk of the work done in the area was by workers

in Germany. For example, there is only one reference to the work of Heeger out of the 53 references that appear for organic conductors and superconductors.

The level of the presentation is, as advertised, predicated on a good grasp of solid-state physics. Equations are used with reserve and mainly for illustrative purposes. Because of this, the book is not extremely daunting for those, mostly chemists, who have little or no knowledge of solid-state physics. This may present a problem with conveying the complexity of many topics, such as lattice dynamics, that may not be appreciated by those relatively unfamiliar with the physics. Nevertheless, the book can be useful for these readers by giving a flavor of the problems that are in the field and the kind of physical phenomena that may be modified by creative modification or synthesis of the molecules that comprise the crystal. A further advantage is the availability, in one tome, of a catalog of the physical properties of organic molecular solids with good explanations of their origins. On the other hand, those with a good grasp of solid-state physics would probably like to see a more formal development of the physics. Of course, it is impossible to satisfy the demands of both the novice and the expert and the authors' approach achieves a suitable balance.

The book is more a compendium rather than a detailed exegesis of the phenomena that are addressed. This is not a deficiency since that may be asking too much of anyone, author or reader. In all, the text serves its purpose of providing a survey of the unique physics of organic molecular solids. It is a very welcome addition to those few books that address these interesting and potentially important solids.

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