semiconductor (such as boron, gallium, arsenic, and phosphorus).

Since the 1970s, materials other than silicon and germanium have been investigated for application as semiconductors in transistors, rectifiers, photocells, and tunnel diodes. Most notable among these are compounds made of aluminum, gallium, or indium, mixed with phosphorus, arsenic, or antimony. These compound semiconductors are particularly useful in devices that emit light efficiently or operate at exceptionally high frequencies, such as semiconductor lasers, light-emitting diodes, or solar cells.

KEVIN J. ANDERSON

BOOK REVIEWS

Photoelectronic Properties of Semiconductors

Richard H. Bube
(Cambridge University Press, 1992, 318 pages).
ISBN: 0-521-404916 (hardback); 0-521-406811 (paperback)

In my formative years as a physicist I read this author's book on *Photoconductivity of Solids* (Wiley, 1960), and I was influenced by his clear, authoritative style. The present volume updates much of the previous material, while retaining the style. The author's broad experience is apparent, and this book will be a useful reference.

After an introductory chapter, which could have been longer and more "introductory," the second chapter gives a general treatment of photoconductivity parameters, setting the nomenclature for subsequent chapters and dealing specifically with intrinsic recombination.

Chapters 3 and 4 deal with one-center recombination models, the latter chapter being devoted in detail to the Schockley-Read model. Chapter 5 deals with models in which two recombination centers having markedly different capture coefficients are present, and includes a liberal set of examples drawn largely from the author's own work.

Chapter 6 discusses the various recombination processes that can occur, such as luminescence, phonon emission, and Auger emission; however, I would have placed this chapter earlier in the book. Chapters 7 and 8 are devoted to the most useful experimental methods for photoelectronic measurements on solids. The first of these chapters covers steady-state methods, such as Hall, thermoelectric, capacitive, and luminescence techniques; the second deals with transient measurements and looks at the rates of decay and how these are related to trapping mechanisms. Deep-level transient spectroscopy is covered, but I would have welcomed a clearer exposition and more examples of this technique. Many illustrations of the main points are made in these chapters, again drawn almost exclusively from the author's work.

The effects at grain boundaries, a subject often neglected, are covered in Chapter 9. Chapter 10 provides a good introduction to photoeffects in amorphous semiconductors, a subject worthy of a book by itself. Chapter 11 deals with photovoltaic effects and considers heterojunctions and practical solar cell junctions. However, the subject of the band energy line-up problem, which should be very important, is not discussed. The final chapter covering quantum wells and superlattices is rather superficial and descriptive—a pity, given the examples abounding in the literature. Although I am somewhat disappointed overall, I am sure that the book will be useful in both my research and teaching.

Reviewer: Peter J. Dobson is in the Department of Engineering Science at the University of Oxford, England. His main interests are in the optoelectronic properties of materials.

BOOK REVIEWS

Microstructural Design of Fiber Composites

T-W. Chou
(Cambridge University Press, 1992, 569 pages).
ISBN: 0-521-35482-X

This excellent book by Tsu-Wei Chou is the second venture of the Cambridge Solid State Science Series into the world of composite materials, following Hull's *An Introduction to Composite Materials* and probably emulating it in rapidly becoming a standard text. The book will carry particular weight with composites professionals because it comes from the University of Delaware school where Chou and colleagues have a distinguished research record in the field.

The book's scope is primarily the relationship of physical (mainly mechanical) properties of fiber composites to microstructure, with the emphasis on analysis-prediction of properties for a given structure. It offers little on the difficult inverse problem of how to design the structure in order to achieve a particular profile of properties. Thus the title is somewhat misleading and hopefully will not deter analysts, who will gain the most from the book.

These days, it is common for materials textbooks to begin with an overview chapter on the applications and historical trends in the usage of the materials concerned. Chou's first chapter is particularly successful and should capture the interest of newcomers to the subject.

The next three chapters on structure-property relations in continuous-fiber and short-fiber composites cover familiar ground. But the usual material on laminate mechanics, basic micromechanics, etc. is supplemented by interesting excursions down less-trodden avenues such as thick laminate mechanics and detailed statistical treatments of strength.

In the remaining five chapters, the novelty and breadth of the author's coverage become even more apparent, reflecting the scope of Chou's own research. These chapters deal in turn with hybrids, textile structural composites (two- and three-dimensional), and flexible composites (including the anisotropic, large deformation elasticity theory). The discussion of textile composites extends not only to the analysis of properties in terms of structure, but also to the design of processing route by weaving, knitting, or braiding to achieve a particular fiber arrangement. This will be a great help to engineers meeting such materials for the first time, since textile manufacturing processes usually are not featured on the undergraduate engineering syllabus.

The book is "intended for graduate or advanced undergraduate students," and the inquiring student certainly will find it a prolific source of insight. But the newcomer to composites may need more on background fundamentals (which are assumed by Chou) such as the manipulations of anisotropic elasticity. The selection of topics is also rather idiosyncratic for the book to be used alone as a teaching aid. Its strength lies in providing an authoritative and well-presented survey of most of the art of analyzing the performance of fiber composites in terms of their microstructures. Composites engineers should find this book an invaluable reference.

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