

port, curved geometry for transport media and some computational procedures.

Mingle sets two main objectives in writing this book; first to introduce invariant imbedding to the reactor theory group and shielding group of the nuclear engineering field, and second, to present sufficient results and details of invariant theory so that researchers in this field can use this book as a framework and general background reference.

I think the two objectives are partially fulfilled. The author's approach in introducing the necessary functions and equations is based on an intuitive appeal. This intuitive appeal is well supplemented by the interaction diagrams depicting the components of pertinent equations. The readers would have been better served if conscious attempts were made to show by examples how the ideas developed can be applied.

The book contains some helpful tables. The references to other works are adequate and should prove helpful in further use and study of the subject of the invariant imbedding theory.

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Semiconductor Opto-Electronics

T. S. Moss, G. J. Burrell, B. Ellis
441 pp. Halsted, New York, 1973. \$29.75

Ever since the invention of the transistor in the late 1940's, semiconductors have come under intensive study by physicists and other scientists throughout the world. The optical properties of these substances have aroused particular interest because, in addition to yielding useful basic information, they also contain the seeds for sensitive, fast-response optical devices. The efforts have been highly fruitful, and we now have amassed a great wealth of knowledge and successfully built a variety of semiconductor photoconductors, lasers and lamps that play an integral part in our current technology. Indeed some of these devices, like the spin-flip laser, may well play an important role in solving some of the environmental and communication problems confronting our society.

It is little wonder therefore that a number of books have appeared in recent years devoted exclusively to the optical properties and their applications in semiconductors. In this latest and most attractively titled addition, Trevor Moss and his colleagues, Geoffrey Burrell and Brian Ellis at the

Royal Aircraft Establishment in the UK, cover most areas of current interest in this rapidly expanding field. After two preliminary chapters on the optical parameters and dispersion relations, the book goes on to explore the absorption processes that occur in semiconductors. This is an in-depth discussion covering topics such as inter-band transitions (direct and indirect), exciton absorption, and impurity-to-band transitions. The emphasis accorded absorption processes, the primary theme of the book, is justified by the fact that these very processes determine also the dielectric properties, for example, the refractive index, via the well known Kramers-Kronig relations. Equally important from the practical viewpoint is the fact that these processes are directly responsible for most technological applications, such as photoelectric effects, lasers and lamps, which are taken up in considerable detail in later chapters of the book. There are also treatments of other modern topics such as magneto- and nonlinear optics.

The discussion throughout is authoritative and up to date (many of the results reported have been published in 1972), as one expects from three experienced and active researchers. The research physicist will appreciate the painstaking attention given to practical matters, such as the various techniques of measuring optical parameters, and the student will find instructive and lively illustrations of the theory he has labored so hard to learn in the classroom. I particularly enjoyed the numerous experimental graphs and tables distributed throughout the book. Many readers will certainly find the extensive reference list very helpful; it contains about 1500 items which often go beyond the area of optical properties. It is a pity that titles of articles could not be included.

In the authors' words, "the book is intended primarily for physicists in academic research or commercial device development and for honours students specialising in solid-state physics." Consequently, there is little discussion of the theory and the authors usually attempt to get to the final results, to be tested or exploited experimentally, in the quickest possible manner. This program places a heavy burden on the background of the reader. In order to derive substantial benefit, he should have had good courses in semiconductor theory and quantum mechanics, preferably on the graduate level. While it is not unreasonable to expect such a sophisticated background from a research physicist, it is very doubtful that the student would be able to digest the material given here without a great deal of effort and guidance.

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While I fully realize that it is unreasonable to expect a full theoretical treatment in a book of this kind, a concise and coherent summary of theoretical results would have rendered the reading more profitable, efficient and enjoyable. Unfortunately, the summaries, when given, are often too sketchy, unorganized and not very informative. This will turn out to be a major weakness of this book. The book does not contain problems, and it generally suffers from a dearth of illustrative diagrams, facts that detract from its adoption in the classroom.

On balance, this is a work written by applied physicists whose efforts for taking the time to report on a very interesting and rapidly expanding area in applied physics should be applauded. The well prepared and motivated reader will find the 441 pages between the covers a veritable storehouse of information on semiconductor materials.

M. ALI OMAR

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new books

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Proceedings of the 1973 CERN-JINR School of Physics. (Ebeltoft, Denmark, 17-30 June 1973). 365 pp. CERN, Geneva, 1973.

Atoms and Molecules

Diatomic Molecules, A Critical Bibliography of Spectroscopic Data. R. F. Barrow, ed. 440 pp. Centre National de la Recherche Scientifique, Paris, 1973. 150F

Theory of Unimolecular Reactions. W. Forst. 445 pp. Academic, New York, 1973. \$29.50

Chemical Physics

Advances in Electronics and Electron Physics, Vol. 34. L. Marton, ed. 362 pp. Academic, New York, 1973. \$29.50

Encyclopedia of Electrochemistry of the Elements, Vol. 1. A. J. Bard, ed. 495 pp. Marcel Dekker, New York, 1973. \$60.00

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