Metal Clusters

F. Trager and G. zu Putlitz
(Springer-Verlag, 1986)

This volume contains papers documenting the International Symposium on Metal Clusters held in Heidelberg, April 1986, on the occasion of the 600th anniversary of the university. The book, which originally appeared as the *Journal Zeitschrift für Physik D - Atoms, Molecules and Clusters*, Vol. 3, pulls together current research and presents an accurate overview of the metal cluster field.

The study of metal clusters constitutes a fast growing, interdisciplinary field asking fundamental questions about the properties of matter in the transition from the atomic to the bulk. This transition is of fundamental scientific interest to both solid state scientists and chemists; it also constitutes an area of intense technological interest in fields as far ranging as catalysis and microelectronics. In such a rapidly expanding field, significant progress would be expected in a short period of time. It is interesting to note that, although over a year has intervened since the papers were presented, most of the ideas expounded in this book have been built upon, not discarded. As a result, these well-written chapters will continue to serve as an important foundation for future developments.

The topics covered include extensive discussions of various theoretical approaches to the study of cluster geometry and electronic structure. Ideas about the shell structure of alkali and other simple metal clusters and the use of jellium model to explain these observations are beautifully discussed by Prof. W. Knight, as are the alternate views of Prof. E. Schumacher's group. Several new ionization potential results for alkali are presented, including the elegant work of Dr. Brechignac from Orsay. Various papers also probe the chemical reactivity of clusters and the deposition of monosized clusters into supports. Cluster stability was also probed by a number of workers using a variety of tools.

This handsomely covered volume serves as a snapshot in time of diverse topics in cluster research. The authors concentrate on reporting their own results, thus there is little in the way of critical review and synthesis of the many ideas emerging in the field. That will require a more in-depth, thoughtful book rather than one which records the proceedings of an international conference.

Reviewer: Andrew P. Kaldor is director of the Resource Chemistry Laboratory, Exxon Research and Engineering Company, New Jersey.

Properties of Gallium Arsenide

Datareviews Series No. 2
(INSPEC, 1986)

Properties of Gallium Arsenide is the second book in the Datareviews series of INSPEC, the Institution of Electrical Engineers. It is a compilation of a variety of data on GaAs properties, which are valuable in finding numbers of physical or chemical quantities related to GaAs. Each of more than 30 authors, who are specialists in these particular fields, summarizes every item of GaAs properties in two or three pages and tables. The book covers physical and thermal properties, resistivity, mobilities, energy gap, optical functions, electro-optic properties, photoconductivity, photoluminescence, defects, diffusion of impurities, etching rates, and interfaces and contacts. The last chapter also includes AlGaAs data.

This 346-page book should not be read from cover to cover but rather scanned to become familiar with the kinds of properties presented in it. Then the book can be used as a research reference in obtaining the number of a certain GaAs property when needed.

Some of the properties cited in this book are inherent to GaAs, but others depend on the materials preparation and treatment or measurement. In time, the latter may change with further progress in material preparation and measurement techniques. Therefore, when using numbers cited in this book, it is important to know which properties may change at the time of interest. In this context, continuous updating of the data and revision of this book will be required. Further compilation of other data relating to GaAs is also desired, so that this kind of database will become a complete accumulation of knowledge.

One drawback of this book is the absence of figures, which makes it difficult to obtain information quickly. This should be covered by referring to original literature cited in each of the sections, since many references are quoted. Surprisingly the book's pages are not numbered, making indexing difficult. This may be a simple mistake of the publisher. For these data, online service as a database is also available in file 105 on the European Space Agency Information Retrieval System.

In summary, this book provides very valuable data on a variety of GaAs properties for researchers working in the III-V semiconductors community.

Reviewer: Takashi Ikoma is a professor in the Center for Function-Oriented Electronics, Institute of Industrial Science, University of Tokyo.

Synthetic Modulated Structures

Leroy L. Chang and B.C. Giessen
(Academic Press, 1985)

Synthetic Modulated Structures is a welcome volume in a rapidly expanding field with little recent material available in book form. It serves well the authors' primary purpose as a reference book, although less well as a tutorial. Considering the broad range covered in one volume, this is understandable. Published in The Materials Science and Technology Series of Academic Press, the book deals extensively with the physics of modulated structures as well.

Esaki's chapter on "History and Perspective of Semiconductor Superlattices" serves not only as an interesting documentation of a long history of seminal ideas that eventually found significant scientific and technological expression, but also in foreshadowing important applications which have developed even since publication. This includes, for example, recent demonstrations of multiple quantum well electronic transmission as well as the growing emphasis on strained layer superlattices and pseudomorphic structures.

Coverage of applications in lasers is well done by Holonyak and Hess. It is not complemented by contributions to the many applications inherent in novel heterostructure devices for optical detection, high speed electronics, etc.

Any book dealing with a rapidly advancing field risks becoming outdated rapidly; however, this volume fares reasonably well. Since publication, the general concerns expressed (McWhan) relative to structural perfection seem less pressing as the confidence level of workers in the field has risen because of a significant increase in confirmations of expected behavior of modulated structures.

Schulman and McGill's treatment of theory of quantum well structures provides an excellent treatment of calculation methods and the theory in general. The important contributions of workers such as Tersoff and Margaritondo in providing more systematic and unifying ways of understanding band-offsets and their relationship to Schottky barriers unfortunately came too late for inclusion.

As with any multi-authored volume, some material is repetitious but within tolerable bounds. Overall, this is a competent and needed contribution in an important field lacking good reference books such as this one.

Reviewer: L.J. Varnerin is a professor at Lehigh University, Pennsylvania.