Amorphous and Liquid Semiconductors

Edited by B. K. Chakraverty and D. Kaplan

(Journal de Physique, Supplement FASC 10)

This volume contains the proceedings of the Ninth International Conference on Amorphous and Liquid Semiconductors, held in Grenoble, France, 1981. The 250 papers constitute a useful survey of the international scientific community's efforts in the growing area of amorphous and liquid semiconductors.

The book is divided into two parts. The first half deals with topics of general interest. Theoretical aspects of localization and transport are discussed in the first two symposia. Two symposia are devoted to physical characteristics of the materials, discussing structure and stability and recent work in microcrystalline films. Other symposia deal with optical and vibrational studies, and the related topic of mestastable states. Finally, this section presents various characterization methods, including device studies, transient behavior, and gap state measurements.

The second half of the book presents papers of more specific interest. The first symposium covers material preparation, and most of the work presented deals with amorphous silicon deposition. This is followed by several symposia each covering specific materials studies. Among others, these include silicon, group V and III-V compounds, and chalcogenides.

Overall, the range of topics covered in these proceedings is representative of the level of activity in each area of amorphous and liquid semiconductors. About half the papers deal with amorphous silicon, indicating its increasingly dominant technological significance. Other fields of investigation are well represented, as are various lines of theoretical study.

Reviewer: R. C. Frye is a member of the technical staff at AT&T Bell Laboratories in Murray Hill, NJ. He has researched amorphous and polycrystalline semiconductors, and maintains an interest in the application of these materials.

Pulsed Laser Processing of Semiconductors

Edited by R.F. Wood, C.W. White and R.T. Young

(Academic Press, 1985)

This book is the newborn volume in the successful field of laser annealing. As stated by the editors this is a mono-laboratory book with all the advantages and disadvantages of such an arrangement. For example, repetition from chapter to chapter is minimized. The book is well organized into 10 chapters, the first one giving a broad overview of laser processing. Segregation and solute trapping phenomena are smoothly summarized in Chapter 2. The excellent review of optical and electrical properties in Chapter 3 also provides a good amount of valuable numbers for those interested in a quantitative evaluation of such parameters.

The next two chapters are questionable: they detail the point of view of the chapter authors but give very little or no space to other interpretations of the described processes. For example, the formation of a fine polycrystalline layer at the bottom of a large polycrystalline layer as a consequence of partial melting of amorphous silicon is interpreted only in terms of nucleation from the undercooled melt. The other mechanism proposed in the literature, i.e., the explosive crystallization process, is simply neglected. Similarly, it concerns models to interpret the velocity dependence of the interfacial segregation coefficient.

After a few good chapters on time-resolved measurements, gallium arsenide, surface studies and carbon dioxide laser processing, the mono-laboratory soul of the book comes out at the end where applications are described. In fact, most of this chapter is dedicated to the large amount of work done by the Oak Ridge group on solar cells by using excimer lasers. However, other applications which occupy large portions of MRS books and proceedings are rapidly summarized.

In conclusion, this book can be very useful for certain aspects of laser annealing. The large amount of references compensates for the limitations due to the mono-laboratory origin of this book.

Reviewer: Salvatore Ugo Campisano is a Professor at the University of Catania, Italy. His research interests are in laser and ion beam interactions with solids.

Applied Polymer Science, Second Edition

Edited by R.W. Tess and G.W. Poehlein

(American Chemical Society, 1985)

This second volume of the ACS Symposium Series on Applied Polymer Science contains sections on polymerization mechanisms, physical phenomena, products and uses of polymers, plasticizers and solvents. Contributions by both academia and industry are aimed at students as well as workers in the field. A worthwhile introductory section contains a historical review and a primer on polymer science technology.

The section on polymerization mechanisms provides in-depth discussions of the various means of polymerization, taking the reader from early to recent developments, thus giving some perspective to nonspecialists.

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A relatively short section devoted to physical phenomena is not as useful as the other sections and is lacking in a general discussion of the mechanical behavior of the more common structural polymers. This section treats structure-property relationships, transport properties, fracture mechanics, and flammability of polymers.

The large section that discusses polymer products and uses is well written and contains good historical and economic perspectives. The topics include structural plastics, manmade polymers, foams, insulators, medical and aerospace applications, and processing methods.

The section on plasticizers and solvents also provides a good general survey for the nonspecialist. The papers in this section detail the historical development of these materials, their properties and uses without involving the reader in theoretical discussions.

A large portion of the volume devoted to coatings and related products is user oriented and provides a comprehensive treatment of coatings from a historical overview to recent developments. This section contains a primer on analysis methods as well as papers on the physical chemistry, applications, curing methods, and economics of coatings. This is followed by a small section which provides a similar treatment for pigments and paints.

In general, this book is recommended to those who want a source book on applied polymer science without becoming too involved in theoretical issues. With few exceptions, the papers provide numerous references of historical and technical interest. One weak point, however, is the index which is understandably lacking in depth and detail.

Reviewer: David T. Raske is a principal investigator of structural materials in the Materials Science and Technology Division at Argonne National Laboratory. His research interests are in the mechanical properties of structural materials.

Desorption Mass Spectrometry: Are SIMS and FAB the Same?

Edited by P.A. Lyon

(*American Chemical Society, 1985*)

This symposium volume consists of 14 chapters by 23 authors and is organized into three sections. The first section discusses views of leading workers concerning fundamental processes which occur in desorption mass spectrometry. The discussion considers desorption from both solid and liquid matrices accomplished by thermal processes, laser irradiation, or bombardment with atoms, ions or nuclides. The second section considers issues of instrument design, and the third section discusses some applications of secondary ion mass spectrometry (SIMS) and fast atom bombardment mass spectrometry (FABMS).

The first section provides a good review of the current status of knowledge concerning mechanisms of desorption and ionization processes as they occur in conventional desorption mass spectrometry experiments. The principal message is that the similarities of results obtained with organics (more precisely, with molecules) using various initiating events, whether bombardment with ions or atoms or laser irradiation, bespeak a remarkable insensitivity of analyte molecules to the primary energy form used. This portion of the book successfully meets the stated goals "to demythologize the subject of particle bombardment" and "to bridge the gap that often exists between researchers in the fields of SIMS and FABMS." Attention is focused on the complex but critical role of matrices in desorption mass spectrometry.

The second and third sections relate less successfully to the question posed in the book subtitle "Are SIMS and FAB the same?" because of the real differences which exist in the user communities. SIMS, now sometimes called dynamic SIMS, was developed for sputtering and analysis of atomic ions from metallic or inorganic matrices and is still used primarily for this purpose. FABMS is used almost exclusively for analysis of molecules, in common with the more recently developed technique of "static" or "molecular" SIMS. In discussions of instrumental parameters and in considerations of applications, interests diverge: few spectrometrists or their clients are concerned with the two quite different areas of analytical application. Therefore, unlike the first several chapters which discuss fundamental principles of general interest, the remaining chapters are directed sequentially to the two separate audiences or, in some cases, to only one of the two groups.

In common with most multi-authored works there is much redundancy; most chapters introductions are interchangeable. The quality of chapters is uniformly high and the work presented is current; most chapters were received by the editor in April 1985. There are infrequent typographical errors which do not seriously detract. I found only two really annoying mistakes. In the chapter by Macfarlane, pages 59 and 60 are printed out of sequence and in the chapter by Magee, Figure 1 (p. 98), which is a schematic representation of a SIMS instrument, mysteriously includes the phrase "Aldehyde/Ketone Derivatization."

Reviewer: G. Doyle Daves, Jr., Professor of Chemistry at Lehigh University, is an organic chemist whose research interests include many applications of mass spectrometry. During the past two decades he has published work involving various aspects of mass spectrometry including numerous desorption studies of polar organics.

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