Deep Implants

G.G. Bentini, A. Golanski, S. Kalbitzer
North Holland, 1989, approximately 257 pages. ISBN: 0-444-87332-5

Implantation of ions at MeV energies, at depths of several microns, provides a highly controllable way to produce buried, well-defined layers of altered composition of doping within a solid. Furthermore, when coupled with suitable thermal treatment, the process can be engineered to leave little or no radiation damage in the overlaying surface material. In recent years, the technique has produced much excitement in the field of semiconductor device technology, where the SIMOX process is now seen as a promising step toward integral, multilayered structures. In that process, oxygen is implanted in hot single-crystal silicon, to produce a buried planar layer of SiO_2, covered by device-quality single-crystal silicon.

Deep Implants contains the proceedings of a symposium of the European Materials Research Society held in June 1988, and it presents a timely and representative collection of good research papers on the subject of deep implants.

Several papers provide succinct summaries of the current technology status, e.g., for VLSI applications (A.N. Saxena and D. Pramanik), or SIMOX (H. Baumgart and A.H. van Ommen). Reports and reviews on a wider range of topics demonstrate the variety of areas in which future promise is seen for deep implantation. Fundamental mechanisms of implantation and ion beam interaction are treated in several papers, e.g., O. Puglisi on ion beam effects in polymers, and J.M. Poate on MeV ion interactions in silicon. Calculations and simulations of ion range distributions are the subject of several papers. Accelerators designed for high current MeV implantation are described in a set of superficial papers presented by the equipment vendors.

This volume is excellently bound and printed. As a delightful bonus, it includes three plenary papers presented at the E-MRS Meeting, dealing with high T_c superconducting ceramics, new device structures, and future VLSI technology.

This book provides an up-to-date snapshot of research in the field of deep implantation, and it will find its principal place in the hands of other researchers active in this field today. It is not, and does not pretend to be, an instructional text book, or a comprehensive set of pedagogic reviews. However, it reflects the vitality of an emerging research field, and its contents will be especially important for researchers and for process design engineers who wish to look ahead to potential strategies for the next decade.

Reviewer: John E.E. Baglin is a physicist at the IBM Almaden Research Center. His research interests include thin-film and interface interactions, radiation effects and implantation in solids, and thin-film adhesion phenomena.

The Vibrational Spectroscopy of Polymers

D.I. Bower and W.F. Maddams
Cambridge University Press, 1989, 300 pages. ISBN: 0-521-24633-4

Polymer characterization is an essential part of polymer science and technology, and this latest addition to the Cambridge Solid State Science series makes an excellent contribution to an increasingly important and fashionable area of chemistry.

The 300-page book deals with the theory and practice of infrared and Raman spectroscopy as applied to the physical and chemical characteristics of synthetic polymers. It is written in a clear and concise style with a good selection of well-produced tables, figures and spectra. Its purpose is to give the new researcher in the field, with either a physics or a chemistry background, a firm foundation for the study of the more advanced literature. The authors assume no knowledge of either polymers or of vibrational spectroscopy, but undergraduate students and readers completely new to both areas will probably need to consult more elementary texts to supplement the present book.

The six chapters divide into two broad themes: the first four chapters, which comprise the first half of the book, provide the underlying theory and practice for polymer chemistry and vibrational spectroscopy, while the last two chapters deal with the spectroscopic analyses of polymer systems, using examples where the interpretation of the spectra is now generally accepted as established. Thus Chapter 1 covers basic fundamentals of polymer types, as well as an introduction to vibrational spectroscopy, spectrometers and experimental methods. Chapter 2 comprises 40 pages on symmetry and normal modes of small molecules. Chapter 3 discusses the vibrational modes of polymer chains and crystals and Chapter 4 is a semiclassical treatment of the origins of vibrational spectra, polarization effects, vibrational assignments, force fields and vibrational calculations. With the necessary background knowledge in place, the authors begin the detailed interpretation of polymer spectra using factor group analysis and group frequencies (Chapter 5, 70 pages). This chapter also covers important aspects of quantitative analysis which is a topic often omitted from research texts.

Finally, Chapter 6 (70 pages) is another substantial body of information on the microstructure of polymers, including topics such as the distribution of copolymerized units in the polymer chain, configurational and conformational isomerism, chain branching, hydrogen bonding, chain order and crystallinity.

Alternative books and reviews at the end of each of the first four chapters supplement the ideas covered. Key references given in Chapters 5 and 6 to classic papers on the interpretation of polymer spectra are collected together at the end of the book.

The authors are to be congratulated on producing a worthy addition to this important series on solid-state chemistry. Some readers may prefer to see the theory and practice in the first half curtailed somewhat to allow more space for the interpretation of additional polymer spectra. This may be the case for those already familiar with much of the background theory or for new students to spectroscopy who, almost certainly, would need to refer to alternative texts to achieve a full understanding of the topic. However, it is always attractive to have all the necessary background theory and the spectral interpretations collected together in the same book.

Reviewer: Brian P. Straughan is a senior lecturer/deputy head in the Department of Chemistry, University of Newcastle upon Tyne. He is the co-editor of a book on vibrational spectroscopy and has published over 70 papers in this field. □

https://doi.org/10.1557/S0883769400060024 Published online by Cambridge University Press