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Theory Defects Semiconductors Topics Applied Inelastic scattering and carrier capture by defects in semiconductors are the primary causes of hot-electron-mediated degradation of power devices, which holds up their commercial development. At the same time, carrier capture is a major issue in the performance of solar cells and light-emitting diodes.

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Theory of defects in semiconductors, (Topics in applied physics, Vol. 104), Softcover reprint of hardcover 1st ed. 2007 Topics in Applied Physics Series, Vol. 104 Coordinators: Drabold David A., Estreicher Stefan Language: Anglais

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All semiconductors, whether by design or by accident, contain defects. The fundamental properties of defects, such as impurities, native defects, and extended defects, affect a broad range of applications. These technologically important defects may be introduced during growth and processing. Electrical, optical, and magnetic phenomena related to defects have been observed experimentally and studied theoretically in a variety of materials.

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Semiconductor science and technology is the art of defect engineering. The theoretical modeling of defects has improved dramatically over the past decade. These tools are now applied to a wide range of materials issues: quantum dots, buckyballs, spintronics, interfaces, amorphous systems, and many others. This volume presents a coherent and detailed description of the field, and brings together leaders in theoretical research. Today's state-of-the-art, as well as tomorrow's tools, are discussed: the supercell-pseudopotential method, the GW formalism,Quantum Monte Carlo, learn-on-the-fly molecular dynamics, finite-temperature treatments, etc. A wealth of applications are included, from point defects to wafer bonding or the propagation of dislocation.

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This volume, number 91 in the Semiconductor and Semimetals series, focuses on defects in semiconductors. Defects in semiconductors help to explain several phenomena, from diffusion to getter, and to draw theories on materials' behavior in response to electrical or mechanical fields. The volume includes chapters focusing specifically on electron and proton irradiation of silicon, point defects in zinc oxide and gallium nitride, ion implantation defects and shallow junctions in silicon and germanium, and much more. It will help support students and scientists in their experimental and theoretical paths. Expert contributors Reviews of the most important recent literature Clear illustrations A broad view,

including examination of defects in different semiconductors

Advances in Semiconductor Nanostructures: Growth, Characterization, Properties and Applications focuses on the physical aspects of semiconductor nanostructures, including growth and processing of semiconductor nanostructures by molecular-beam epitaxy, ion-beam implantation/synthesis, pulsed laser action on all types of III–V, IV, and II–VI semiconductors, nanofabrication by bottom-up and top-down approaches, real-time observations using in situ UHV-REM and high-resolution TEM of atomic structure of quantum well, nanowires, quantum dots, and heterostructures and their electrical, optical, magnetic, and spin phenomena. The very comprehensive nature of the book makes it an indispensable source of information for researchers, scientists, and post-graduate students in the field of semiconductor physics, condensed matter physics, and physics of nanostructures, helping them in their daily research. Presents a comprehensive reference on the novel physical phenomena and properties of semiconductor nanostructures Covers recent developments in the field from all over the world Provides an International approach, as chapters are based on results obtained in collaboration with research groups from Russia, Germany, France, England, Japan, Holland, USA, Belgium, China, Israel, Brazil, and former Soviet Union countries

This book emphasizes the importance of the fascinating atomistic insights into the defects and the impurities as well as the dynamic behaviors in silicon materials, which have become more directly accessible over the past 20 years. Such progress has been made possible by newly developed experimental methods, first principle theories, and computer simulation techniques. The book is aimed at young researchers, scientists, and technicians in related industries. The main purposes are to provide

readers with 1) the basic physics behind defects in silicon materials, 2) the atomistic modeling as well as the characterization techniques related to defects and impurities in silicon materials, and 3) an overview of the wide range of the research fields involved.

Semiconductors and Semimetals has distinguished itself through the careful selection of well-known authors, editors, and contributors. Originally widely known as the "Willardson and Beer" Series, it has succeeded in publishing numerous landmark volumes and chapters. The series publishes timely, highly relevant volumes intended for long-term impact and reflecting the truly interdisciplinary nature of the field. The volumes in Semiconductors and Semimetals have been and will continue to be of great interest to physicists, chemists, materials scientists, and device engineers in academia, scientific laboratories and modern industry. Written and edited by internationally renowned experts Relevant to a wide readership: physicists, chemists, materials scientists, and device engineers in academia, scientific laboratories and modern industry

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technology. Topics included are: band theory applied to semiconductors optical properties and charge transport intrinsic point defects in semiconductors deep centers in semiconductors equilibria, nonequilibria, diffusion, and precipitation dislocations grain boundaries in semiconductors interfaces the hall effect in quantum wires material properties of hydrogenated amorphous silicon high-temperature properties of three-dimensional transition elements in silicon.

Excellent bridge between general solid-state physics textbook and research articles packed with providing detailed explanations of the electronic, vibrational, transport, and optical properties of semiconductors "The most striking feature of the book is its modern outlook ... provides a wonderful foundation. The most wonderful feature is its efficient style of exposition ... an excellent book." Physics Today "Presents the theoretical derivations carefully and in detail and gives thorough discussions of the experimental results it presents. This makes it an excellent textbook both for learners and for more experienced researchers wishing to check facts. I have enjoyed reading it and strongly recommend it as a text for anyone working with semiconductors ... I know of no better text ... I am sure most semiconductor physicists will find this book useful and I recommend it to them." Contemporary Physics Offers much new material: an extensive appendix about the important and by now well-established, deep center known as the DX center, additional problems and the solutions to over fifty of the problems at the end of the various chapters.

A complete reference to computer simulations of inorganic glass materials In Atomistic Simulations of Glasses: Fundamentals and Applications, a team of distinguished researchers and active practitioners delivers a comprehensive review of the fundamentals and practical applications of atomistic simulations

of inorganic glasses. The book offers concise discussions of classical, first principles, Monte Carlo, and other simulation methods, together with structural analysis techniques and property calculation methods for the models of glass generated from these atomistic simulations, before moving on to practical examples of the application of atomistic simulations in the research of several glass systems. The authors describe simulations of silica, silicate, aluminosilicate, borosilicate, phosphate, halide and oxyhalide glasses with up-to-date information and explore the challenges faced by researchers when dealing with these systems. Both classical and ab initio methods are examined and comparison with experimental structural and property data provided. Simulations of glass surfaces and surface-water reactions are also covered. Atomistic Simulations of Glasses includes multiple case studies and addresses a variety of applications of simulation, from elucidating the structure and properties of glasses for optical, electronic, architecture applications to high technology fields such as flat panel displays, nuclear waste disposal, and biomedicine. The book also includes: A thorough introduction to the fundamentals of atomistic simulations, including classical, ab initio, Reverse Monte Carlo simulation and topological constraint theory methods Important ingredients for simulations such as interatomic potential development, structural analysis methods, and property calculations are covered Comprehensive explorations of the applications of atomistic simulations in glass research, including the history of atomistic simulations of glasses Practical discussions of rare earth and transition metal-containing glasses, as well as halide and oxyhalide glasses In-depth examinations of glass surfaces and silicate glass-water interactions Perfect for glass, ceramic, and materials scientists and engineers, as well as physical, inorganic, and computational chemists, Atomistic Simulations of Glasses: Fundamentals and Applications is also an ideal resource for condensed matter and solid-state physicists, mechanical and civil engineers, and those working with bioactive glasses. Graduate students, postdocs, senior undergraduate students, and others

who intend to enter the field of simulations of glasses would also find the book highly valuable.

Excellent bridge between general solid-state physics textbook and research articles packed with providing detailed explanations of the electronic, vibrational, transport, and optical properties of semiconductors "The most striking feature of the book is its modern outlook ... provides a wonderful foundation. The most wonderful feature is its efficient style of exposition ... an excellent book." Physics Today "Presents the theoretical derivations carefully and in detail and gives thorough discussions of the experimental results it presents. This makes it an excellent textbook both for learners and for more experienced researchers wishing to check facts. I have enjoyed reading it and strongly recommend it as a text for anyone working with semiconductors ... I know of no better text ... I am sure most semiconductor physicists will find this book useful and I recommend it to them." Contemporary Physics Offers much new material: an extensive appendix about the important and by now well-established, deep center known as the DX center, additional problems and the solutions to over fifty of the problems at the end of the various chapters.