Self Organized Processes In Semiconductor Alloys Vol 583

#self-organized processes #semiconductor alloys #materials science #solid state physics #nanomaterials self-assembly

Explore the intricate world of self-organized processes in semiconductor alloys, detailing the spontaneous formation of complex structures and their unique properties. This essential resource covers fundamental mechanisms, growth techniques, and applications, providing valuable insights for researchers and students in materials science and solid-state physics.

Self-organized Processes in Semiconductor Alloys

Bringing together experts from the various disciplines involved, this first comprehensive overview of the current level of stress engineering on the nanoscale is unique in combining the theoretical fundamentals with simulation methods, model systems and characterization techniques. Essential reading for researchers in microelectronics, optoelectronics, sensing, and photonics.

Mechanical Stress on the Nanoscale

This book presents a comprehensive account of the phenomenon of spontaneous ordering. The phenomenon, which can be categorized as a self-organized process, is observed to occur spontaneously during epitaxial growth of certain ternary alloy semiconductors and results in a modification of their structural, electronic, and optical properties. There has been a great deal of interest in learning how to control this phenomenon so that it may be used for tailoring desirable electronic and optical properties. There has been even greater interest in exploiting the phenomenon for its unique ability to provide an experimental environment of controlled alloy statistical fluctuations. As such, it impacts areas of semiconductor science and technology related to the materials science of epitaxial growth, statistical mechanics, and electronic structure of alloys and electronic and photonic devices. During the past two decades, significant progress has been made toward understanding the mechanisms that drive this phenomenon and the changes in physical properties that result from it. A variety of experimental techniques have been used to probe the phenomenon and several attempts made at providing theoretical models, both for the ordering mechanisms as well as electronic structure changes. The various chapters of this book provide a detailed account of these efforts during the past decade.

Photovoltaic Energy Program Contract Summary: Fiscal Year 2000

Reducing the size of a coherently grown semiconductor cluster in all three directions of space to a value below the de Broglie wavelength of a charge carrier leads to complete quantization of the energy levels, density of states, etc. Such “quantum dots” are more similar to giant atoms in a dielectric cage than to classical solids or semiconductors showing a dispersion of energy as a function of wavevector. Their electronic and optical properties depend strongly on their size and shape, i.e. on their geometry. By designing the geometry by controlling the growth of QDs, absolutely novel possibilities for material design leading to novel devices are opened. This multiauthor book written by world-wide recognized leaders of their particular fields and edited by the recipient of the Max-Born Award and Medal 2006 Professor Dieter Bimberg reports on the state of the art of the growing of quantum dots, the theory of self-organised growth, the theory of electronic and excitonic states, optical properties and transport in a variety of materials. It covers the subject from the early work beginning of the 1990s up to 2006. The topics addressed in the book are the focus of research in all leading semiconductor and optoelectronic device laboratories of the world.

Spontaneous Ordering in Semiconductor Alloys

This book on gallium nitride (GaN) and associated materials focuses on advances in basic science, as well as the rapidly maturing technologies involving blue/green light emitters, detectors and high-power electronics. A highlight is a report on wide-bandgap semiconductor research done in Europe. Also reported is the commercialization of a laser operating at 405nm wavelength with a 4000-hour device lifetime. At 450nm emission wavelength, significant reductions in lifetime were found, and are believed to arise from nonideal properties of the InGaN alloy used in the active layer of the device. Additional topics include: the significant success of transistors for microwave applications; improvements in the epitaxy of GaN, using both selective area growth techniques (lateral epitaxy overgrowth) and introducing low-temperature intralayers in the films; advances in both molecular beam epitaxy and metal-organic vapor phase epitaxy, including several studies of quantum dot formation in strained alloys and improvements in hydride vapor phase epitaxy, particularly for providing very thick films.

Bulletin of the Russian Academy of Sciences

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Semiconductor Nanostructures

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

GaN and Related Alloys - 1999: Volume 595

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Morphological and Compositional Evolution of Heteroepitaxial Semiconductor Thin Films: Volume 618

One of the goals of materials science is to design alloys with pre-specified desirable technological properties. To achieve this goal, it is necessary to have a thorough understanding of the fundamental mechanisms underlying materials behavior. In particular, one must understand the effects on alloy properties caused by intentional changes in concentration and how the combinations of temperature, time and uncontrollable foreign impurities affect microstructure. In addition to the equilibrium phase information contained in phase diagrams, nonequilibrium dynamic processes and metastable phases are known to be crucial in determining materials properties. This volume brings together researchers working on various aspects of nonequilibrium processes in materials to discuss current research issues and to provide guidelines for future work. Particular attention was paid to understanding particle nucleation and growth, both experimentally and theoretically, solid-state reactions, nanosystems, liquid-solid transformations, and solidification and amorphization. On the theoretical side, fundamental principles governing nucleation and growth, and related phenomena such as coarsening and Ostwald ripening, are discussed. Progress is also reported on the phase field method and on Monte Carlo simulations.

New Methods, Mechanisms and Models of Vapor Deposition: Volume 616

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Optical Microstructural Characterization of Semiconductors: Volume 588

These 38 papers from the April 2000 symposium study granular structure, granular flows, nonlinear waves in granular media, vibrated and rotated granular media, and stress distributions. Topics include jamming in liquids and granular materials, nuclear magnetic resonance studies of granular flows, the blueprint of a concept for a nozzle- free inkjet printer, mixing and segregation processes in a Turbula blender, persistence of granular structure during die compaction of ceramic powders, and humidity-induced cohesion effects in granular media. c. Book News Inc.

Nucleation and Growth Processes in Materials

Interest in wide-bandgap semiconductors for high-power/high-temperature electronics remains prominent. For such applications, SiC is by far the most mature semiconductor material. GaN and diamond, however, have also become prime candidates. While diamond has several advantages over the other two materials, producing large single crystals, as well as the inability to achieve n-type doping, have limited device fabrication. For GaN, recent advances in crystal growth and processing capabilities, as well as excellent transport properties, have yielded a great deal of device development, yet thermal conduction remains an issue. SiC has excellent thermal conductivity, high-breakdown voltages, and well-developed substrates and processing techniques. This book deals with a wide range of technical activity in the area of wide-bandgap high-power/high-temperature electronic devices and covers topics including the fabrication and performance of GaN-based and SiC-based devices, as well as issues related to growth, characterization, and processing of wide-bandgap materials. Several summaries of the current status of the field are provided.

Infrared Applications of Semiconductors

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Infrared Applications of Semiconductors III

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Molecular Electronics: Volume 582

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

The Granular State: Volume 627

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Wide-Bandgap Electronic Devices: Volume 622

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Solid Freeform and Additive Fabrication - 2000: Volume 625

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Materials Development for Direct Write Technologies: Volume 624

Oxide materials are emerging as potential candidates for a variety of existing and new optoelectronic and microwave applications. Critical to enabling this development is the need to have high-quality

materials and to be able to construct viable heterostructures. The existence of improved metal oxide films has enabled a deeper understanding of both the oxides' intrinsic properties and their potential application in real world electronics. Because of their special properties or combinations thereof, oxide films are leading to new classes of devices as well as potentially replacing common semiconductor devices. This book focuses on the materials growth, characterization, processing, and application of oxide films employed as the active elements in devices. A new understanding of basic materials properties is currently being combined with the development of novel heterostructures to lead to whole new classes of devices potentially affecting everything from energy conversion to computer memory. Topics include: applications; new ideas and magnetism; ferroelectrics and related materials; transparent conductors; and film deposition methods.

Polycrystalline Metal and Magnetic Thin Films 2000: Volume 615

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Amorphous and Heterogeneous Silicon Thin Films - 2000: Volume 609

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Magnetic Materials, Structures and Processing for Information Storage: Volume 614

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Electron-Emissive Materials, Vacuum Microelectronics and Flat-Panel Displays: Volume 621

This book, the eighth in a popular series from MRS, features the latest technical information on ferroelectric thin films from an international mix of academia, industry and government organizations. Recent results for DRAM and FERAM devices, as well as enhancements in material performance for these applications, are presented. Significant advances in understanding leakage current, frequency dependence of the coercive field, hydrogen annealing effects, piezoelectric constants, and domain switching responses are highlighted. The development of ferroelectric thin films for piezoelectric applications are also reviewed, as are improved film-fabrication procedures including chemical vapor deposition and chemical solution deposition. Topics include: BST thin films and DRAM; integration and electrodes; Bi-based thin-film ferroelectrics; Pb-based thin-film ferroelectrics; fundamental properties of thin-film ferroelectrics; ferroelectric gate materials and devices; and piezoelectric, pyro-electric and capacitor devices and novel processing strategies.

Materials Science of Novel Oxide-Based Electronics: Volume 623

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Recent Developments in Oxide and Metal Epitaxy - Theory and Experiment: Volume 619

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Morphology and Dynamics of Crystal Surfaces in Complex Molecular Systems: Volume 620

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners. This book, first published in 2000, concentrates on the preparation and processing of interfaces, the relationships between chemistry and structure and the properties and behavior of interfaces, particularly in relation to strength and bonding.

Electroactive Polymers (EAP): Volume 600

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Ferroelectric Thin Films VIII: Volume 596

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

The Optical Properties of Materials: Volume 579

This long-standing symposia series has become the premier, international forum for scientific and engineering issues related to all levels and types of radioactive wastes and their management. Topics include: fuel cladding and spent nuclear fuel; container fabrication and corrosion; performance assessment; repository performance; radionuclide sorption and transport; cement-based materials and waste containment; corrosion of ceramic wasteforms; structure and characterization of ceramics; radiation effects; natural analogs; wasteform characterization and processing; and corrosion and characterization of glass wasteforms.

Magnetoresistive Oxides and Related Materials: Volume 602

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Interfacial Engineering for Optimized Properties II: Volume 586

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Thin Films - Stresses and Mechanical Properties VIII: Volume 594

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Multiscale Phenomena in Materials - Experiments in Modeling: Volume 578

This proceedings of the April 2000 symposium deals with formation of electrical junctions in the front-end processing of devices for the approaching end-of-the-roadmap. The 60 papers address 2D dopant characterization, ion implantation and shallow junction technology, group III diffusion and activation, carbon diffusion and activation, group V diffusion and activation, vacancy-type defects, regrown amorphous layers, and structure and properties of point and extended defects. Topics include ultra-shallow junction formation and gate activation in deep-submicron CMOS, low energy implantation of boron with decaborane ions, modeling ramp rate effects on shallow junction formation, clustering equilibrium and deactivation kinetics in As doped silicon, and atomistic modeling of complex silicon processing scenarios. c. Book News Inc.

Scientific Basis for Nuclear Waste Management XXIII: Volume 608

The presentations from the symposium are grouped into the following topics: skutterudites, superlattice, new materials, quantum wires and dots, half-heusler alloys and quasicrystals, TE theory, thermionics, clathrates, and thin films TE. In addition, poster sessions include the following: semiconductors with tetrahedral anions as potential thermoelectric materials, lattice dynamics study of anisotropic heat conduction in supperlattices, structure and thermoelectric properties of new quaternary tin and lead Bismuth selenides, attributes of the Seebeck coefficient of Bismuth microwire array composites, and High-Z Lanthanum-Cerium Hexaborate thin films for low-temperature applications. c. Book News Inc.

Applications of Synchrotron Radiation Techniques to Materials Science V: Volume 590

Advances in Materials Problem Solving with the Electron Microscope: Volume 589