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This book brings together the most up-to-date information on the fabrication techniques, properties, and potential applications of low dimensional silicon carbide (SiC) nanostructures such as nanocrystallites, nanowires, nanotubes, and nanostructured films. It also summarizes the tremendous achievements acquired during the past three decades involving structural, electronic, and optical properties of bulk silicon carbide crystals.

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Silicon Carbide Nanostructures : Fabrication, Structure, and Properties. ... Silicon carbide nanostructures exhibit a range of fascinating and industrially important properties, such as stability of photoluminescence, inertness to chemical surroundings, and good biocompatibility.

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silicon carbide nanostructures fabrication structure and properties provides a unique reference book for researchers and graduate students in this emerging field it is intended for materials scientists physicists chemists and engineers in microelectronics optoelectronics and biomedical engineering Silicon Carbide Nanostructures Springerlink

This book brings together the most up-to-date information on the fabrication techniques, properties, and potential applications of low dimensional silicon carbide (SiC) nanostructures such as nanocrystallites, nanowires, nanotubes, and nanostructured films. It also summarizes the tremendous achievements acquired during the past three decades involving structural, electronic, and optical properties of bulk silicon carbide crystals. SiC nanostructures exhibit a range of fascinating and industrially important properties, such as diverse polytypes, stability of interband and defect-related green to blue luminescence, inertness to chemical surroundings, and good biocompatibility. These properties have generated an increasing interest in the materials, which have great potential in a variety of applications across the fields of nanoelectronics, optoelectronics, electron field emission, sensing, quantum information, energy conversion and storage, biomedical engineering, and medicine. SiC is also a most promising substitute for silicon in high power, high temperature, and high frequency microelectronic devices. Recent breakthrough pertaining to the synthesis of ultra-high quality SiC single-crystals will bring the materials closer to real applications. Silicon Carbide Nanostructures: Fabrication, Structure, and Properties provides a unique reference book for researchers and graduate students in this emerging field. It is intended for materials scientists, physicists, chemists, and engineers in microelectronics, optoelectronics, and biomedical engineering.

The book presents an in-depth review and analysis of Silicon Carbide device processing. The main topics are: (1) Silicon Carbide Discovery, Properties and Technology, (2) Processing and Application of Dielectrics in Silicon Carbide

Devices, (3) Doping by Ion Implantation, (4) Plasma Etching and (5) Fabrication of Silicon Carbide Nanostructures and Related Devices. The book is also suited as supplementary textbook for graduate courses. Keywords: Silicon Carbide, SiC, Technology, Processing, Semiconductor Devices, Material Properties, Polytypism, Thermal Oxidation, Post Oxidation Annealing, Surface Passivation, Dielectric Deposition, Field Effect Mobility, Ion Implantation, Post Implantation Annealing, Channeling, Surface Roughness, Dry Etching, Plasma Etching, Ion Etching, Sputtering, Chemical Etching, Plasma Chemistry, Micromasking, Microtrenching, Nanocrystal, Nanowire, Nanotube, Nanopillar, Nanoelectromechanical Systems (NEMS).

Recent advances in nanotechnology have paved the way for the development of new smart materials. The term "smart ceramics" refers to ceramic materials fabricated from ultrafine particles. They have attracted the attention of researchers and scientists thanks to their potential to manipulate the length scale in the nanorange, leading to better and some unusual material properties. Smart ceramics ensure control of particle size, surface contamination, and degree of agglomeration. They play a crucial role in challenging applications such as bone surgery (e.g., the development of substitutes for load-bearing bone parts) and in biomedical science, especially in tissue engineering, dental applications, and drug and antigen delivery using modified ceramics. Porous nanostructured ceramics have potential use in both simple and complex applications, such as bioimaging, sensors, paints and pigments, optics, and electronics, because of their surface- and size-dependent properties. For the synthesis of smart ceramics, the sol-gel route has been mainly utilized because of its ability to produce a large variety of compositions and to ensure homogeneous mixing of the constituent particles at low temperature. This book describes the innovations in technologies through the development of functionalized ceramic materials for various applications. It also describes recent and expected challenges, along with their potential solutions, in advanced techniques for the synthesis and characterization of nanostructured ceramics and their composites: bioceramics, bioactive ceramics, multifunctional nanoceramics, transparent ceramics, nanocore shells, nanowires, thin films, nanotubes, and nanorods. The applications include the environment, health care, electrochemical sensors, high-temperature superconductors, nuclear reactor fuels, electrical insulators, refractory materials, electrical transformers, and magnetic core memory. The book will benefit researchers, scientists, engineers, and technologists working in the industry and in national and international research laboratories; academics who are interested in traditional and advanced smart ceramic composites; and students pursuing their postgraduate, graduate, and undergraduate degrees in smart ceramics, nanomaterials, nanoscience, and engineering.

The book presents an in-depth review and analysis of Silicon Carbide device processing. The main topics are: (1) Silicon Carbide Discovery, Properties and Technology, (2) Processing and Application of Dielectrics in Silicon Carbide Devices, (3) Doping by Ion Implantation, (4) Plasma Etching and (5) Fabrication of Silicon Carbide Nanostructures and Related Devices. The book is also suited as supplementary textbook for graduate courses. Keywords: Silicon Carbide, SiC, Technology, Processing, Semiconductor Devices, Material Properties, Polytypism, Thermal Oxidation, Post Oxidation Annealing, Surface Passivation, Dielectric Deposition, Field Effect Mobility, Ion Implantation, Post Implantation Annealing, Channeling, Surface Roughness, Dry

Etching, Plasma Etching, Ion Etching, Sputtering, Chemical Etching, Plasma Chemistry, Micromasking, Microtrenching, Nanocrystal, Nanowire, Nanotube, Nanopillar, Nanoelectromechanical Systems (NEMS).

Since the 1997 publication of "Silicon Carbide - A Review of Fundamental Questions and Applications to Current Device Technology" edited by Choyke, et al., there has been impressive progress in both the fundamental and developmental aspects of the SiC field. So there is a growing need to update the scientific community on the important events in research and development since then. The editors have again gathered an outstanding team of the world's leading SiC researchers and design engineers to write on the most recent developments in SiC.

This book is dedicated to field emission electronics, a promising field at the interface between classic vacuum electronics and nanotechnology. In addition to theoretical models, it includes detailed descriptions of experimental and research techniques and production technologies for different types of field emitters based on various construction principles. It particularly focuses on research into and production of field cathodes and electron guns using recently developed nanomaterials and carbon nanotubes. Further, it discusses the applications of field emission cathodes in new technologies such as light sources, flat screens, microwave and X-ray devices.

Authored by leading experts from around the world, the three-volume Handbook of Nanostructured Thin Films and Coatings gives scientific researchers and product engineers a resource as dynamic and flexible as the field itself. The first two volumes cover the latest research and application of the mechanical and functional properties of thin films and coatings, while the third volume explores the cutting-edge organic nanostructured devices used to produce clean energy. This second volume, Nanostructured Thin Films and Coatings: Functional Properties, focuses on functional properties (i.e., optical, electronic, and electrical) and related devices and applications. It also addresses topics such as: Large-scale fabrication of functional thin films using nanoarchitecture via chemical routes Fabrication and characterization of SiC nanostructured/nanocomposite films Low-dimensional nanocomposite fabrication and its applications Optical and optoelectronic properties of silicon nanocrystals embedded in SiO2 matrix Electrical properties of silicon nanocrystals embedded in amorphous SiO2 matrix Optical aspects of properties and applications of sol-gel-derived nanostructured thin films Controllably micro/nanostructured films and devices Thin-film shape memory alloy for microsystem applications A complete resource, this handbook provides the detailed explanations that newcomers need, as well as the latest cutting-edge research and data for experts. Covering a wide range of mechanical and functional technologies, including those used in clean energy, these books also feature figures, tables, and images that will aid research and help professionals acquire and maintain a solid grasp of this burgeoning field. The Handbook of Nanostructured Thin Films and Coatings is composed of this volume and two others: Nanostructured Thin Films and Coatings: Mechanical Properties Organic Nanostructured Thin Film Devices and Coatings for Clean Energy

A variety of nanomaterials have excellent optoelectronic and electronic properties for novel device applications. At the same time, and with advances in silicon integrated circuit (IC) techniques, compatible Si-based nanomaterials hold promise of applying the advantages of nanomaterials to the conventional IC industry. This book focuses not only on silicon nanomaterials, but also summarizes up-to-date developments in the integration of non-silicon nanomaterials on silicon. The book showcases the work of leading researchers from around the world who address such key questions as: Which silicon nanomaterials can give the desired optical, electrical, and structural properties, and how are they prepared? What nanomaterials can be integrated on to a silicon substrate and how is this accomplished? What Si-based nanomaterials may bring a breakthrough in this field? These questions address the practical issues associated with the development of nanomaterial-based devices in applications areas such as solar cells, luminous devices for optical communication (detectors, lasers), and high mobility transistors. Investigation of silicon-based nanostructures is of great importance to make full use of nanomaterials for device applications. Readers will receive a comprehensive view of Si-based nanomaterials, which will hopefully stimulate interest in developing novel nanostructures or techniques to satisfy the requirements of high performance device applications. The goal is to make nanomaterials the main constituents of the high performance devices of the future.