Wide Band Gap Semiconductor Nanowires For Optical Devices

Semiconductor NanowiresOxide Nanowires for Sensing, Photonics and PhotovoltaicsWide Band Gap Semiconductor Nanowires 2Fundamentals of Micro-OpticsSilicon Nanomaterials SourcebookComputational NanophotonicsNanofabricationNanoscience in Food and Agriculture 4UV-VIS and Photoluminescence Spectroscopy for Nanomaterials CharacterizationMagnetic Assembly of NanowiresConference on Lasers and Electro-optics EuropeManufacturing Science and Technology, AEMT2011III-Nitride Semiconductor NanowiresConference on Lasers and Electro-optics2003 Conference on Lasers and Electro-Optics EuropeSemiconductor NanowiresOptical Resonances of Semiconductor NanowiresSilicon NanowiresSynthesis and Manipulation of Metallic NanowiresSynthesis and Applications of Hybrid Nanowires J Arbiol Matthew David Law Vincent Consonni Hans Zappe Klaus D. Sattler Sarhan Musa Ampere A. Tseng Shivendu Ranjan Challa S.S.R. Kumar Carlos Maldonado Hangarter Peng Cheng Wang Tevye Ryan Kuykendall Conference on Lasers and Electro-optics Europe Yiying Wu Linyou Cao Erik Christian Garnett Anne K. Bentley Devin Michael Metz

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Metallic Nanowires Synthesis and Applications of Hybrid Nanowires *J Arbiol Matthew David Law Vincent Consonni Hans Zappe Klaus D. Sattler Sarhan Musa Ampere A. Tseng Shivendu Ranjan Challa S.S.R. Kumar Carlos Maldonado Hangarter Peng Cheng Wang Tevye Ryan Kuykendall Conference on Lasers and Electro-optics Europe Yiying Wu Linyou Cao Erik Christian Garnett Anne K. Bentley Devin Michael Metz*

semiconductor nanowires promise to provide the building blocks for a new generation of nanoscale electronic and optoelectronic devices semiconductor nanowires materials synthesis characterization and applications covers advanced materials for nanowires the growth and synthesis of semiconductor nanowires including methods such as solution growth movpe mbe and self organization characterizing the properties of semiconductor nanowires is covered in chapters describing studies using tem spm and raman scattering applications of semiconductor nanowires are discussed in chapters focusing on solar cells battery electrodes sensors optoelectronics and biology explores a selection of advanced materials for semiconductor nanowires outlines key techniques for the property assessment and characterization of semiconductor nanowires covers a broad range of applications across a number of fields

this book the second of two volumes describes heterostructures and optoelectronic devices made from gan and zno nanowires over the last decade the number of publications on gan and zno nanowires has grown exponentially in particular for their potential optical applications in leds lasers uv detectors or solar cells so far such applications are still in their infancy which we analyze as being mostly due to a lack of understanding and control of the growth of nanowires and related heterostructures furthermore dealing with two different but related semiconductors such as zno and gan but also with different chemical and physical synthesis methods will bring valuable comparisons in order to gain a general approach for the growth of wide band gap nanowires applied to optical devices

from optical fundamentals to advanced applications this comprehensive guide to micro optics covers all the key areas for those who need an in depth introduction to micro optic devices technologies and applications topics covered range from basic optics optical materials refraction and diffraction to micro mirrors micro lenses diffractive optics optoelectronics and fabrication advanced topics such as tunable and nano optics are also discussed real world case studies and numerous worked examples are provided throughout making complex concepts easier to follow whilst an extensive bibliography provides a valuable resource for further study with exercises provided at the end of each chapter to aid and test understanding this is an ideal textbook for graduate and advanced undergraduate students taking courses in optics photonics micro optics microsystems and mems it is also a useful self study guide for research engineers working on optics development

this comprehensive tutorial guide to silicon nanomaterials spans from fundamental properties growth mechanisms and processing of nanosilicon to electronic device energy conversion and storage biomedical and environmental applications it also presents core knowledge with basic mathematical equations tables and graphs in order to provide the reader with the tools necessary to understand the latest technology developments from low dimensional structures quantum dots and nanowires to hybrid materials arrays networks and biomedical applications this sourcebook is a complete resource for anyone working with this materials covers fundamental concepts properties methods and practical applications focuses on one important type of silicon nanomaterial in every chapter discusses formation properties and applications for each material written in a tutorial style with basic equations and fundamentals included in an extended introduction highlights materials that show exceptional properties as well as strong prospects for future applications klaus d sattler is professor physics at the university of hawaii honolulu having earned his phd at the swiss federal institute of technology eth in zurich he was honored with the walter schottky prize from the german physical society and is the editor of the sister work also published by taylor francis carbon nanomaterials sourcebook as well as the acclaimed multi volume handbook of nanophysics

this reference offers tools for engineers scientists biologists and others working with the computational techniques of nanophotonics it introduces the key concepts of computational methods in a manner that is easily digestible for newcomers to the field the book also examines future applications of nanophotonics in the technical industry and covers new developments and interdisciplinary research in engineering science and medicine it provides an overview of the key computational nanophotonics and describes the technologies with an emphasis on how they work and their key benefits

many of the devices and systems used in modern industry are becoming progressively smaller and have reached the nanoscale domain nanofabrication aims at building nanoscale structures which can act as components devices or systems in large quantities at potentially low cost nanofabrication is vital to all nanotechnology fields especially for the realization of nanotechnology that involves the traditional areas across engineering and science this is the first book solely dedicated to the manufacturing technology in nanoscale structures devices and systems and is designed to satisfy the growing demands of researchers professionals and graduate students both conventional and non conventional fabrication technologies are introduced with emphasis on multidisciplinary principles methodologies and practical applications while conventional technologies consider the emerging techniques developed for next generation lithography non conventional techniques include scanning probe microscopy lithography self assembly and imprint lithography as well as techniques specifically developed for making carbon tubes and molecular circuits and devices sample chapter s chapter 1 atom molecule and nanocluster manipulations for nanostructure fabrication using scanning probe microscopy 3 320 kb contents atomic force microscope lithography n kawasegi et al nanowire assembly and integration z gu d h gracias extreme ultraviolet lithography h kinoshita electron projection lithography t miura et al electron beam direct writing k yamazaki electron beam induced deposition k mitsuishi focused ion beams and interaction with solids t ishitani et al nanofabrication of nanoelectromechanical systems nems emerging techniques k l ekinci j brugger and other papers readership researchers professionals and graduate students in the fields of nanoengineering and nanoscience

in this book we present ten chapters describing the synthesis and application of nanomaterials for health food agriculture and bioremediation nanomaterials with unique properties are now being used to improve food and agricultural production research on nanomaterials is indeed revealing new applications that were once thought to be imaginary specifically applications lead to higher crop productivity with nanofertilisers better packaging longer food shelf life and better sensing of aromas and contaminants these applications are needed in particular in poor countries where food is scarce and the water quality bad nanotechnology also addresses the age old issue of water polluted by industrial urban and agricultural pollutants for instance research produces nanomaterials that clean water more efficiently than classical methods thus yielding water for drinking and irrigation however some nanomaterials have been found to be toxic therefore nanomaterials should be engineered to be safe for the environment

second volume of a 40 volume series on nanoscience and nanotechnology edited by the renowned scientist challa s s r kumar this handbook gives a comprehensive overview about uv visible and photoluminescence spectroscopy for the characterization of nanomaterials modern applications and state of the art techniques are covered and make this volume essential reading for research scientists in academia and industry in the related fields

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semiconductor nanowires are one of the most exciting frontiers of materials research due to their potential applications in a wide range of important fields including information technology biomedicine sustainable energy and artificial intelligence embarking on these exciting applications heavily hinges on deep understanding of fundamental properties of the nanowires for the first time we experimentally demonstrate the general existence of strong tunable optical resonances in semiconductor nanowires and propose a theoretical model leaky mode resonances lmrs that provides an intuitive understanding of the optical resonances the optical

resonances enable to engineer light absorption scattering and emission of the nanowires for the rational design of high performance optoelectronic devices including photodetectors solar cells and light emitters more interestingly coupled optical resonances in a complex nanowire structure can give rise to many novel optical functionalities that do not exist in stand alone nanowires for example coupled nanowire optical waveguiding physically the optical resonances arise from strong and resonant coupling of light with leaky modes supported by the nanowires when the light wavelength matches one of the allowed lmrs the high refractive index wire can capture and trap the light by multiple internal reflections at its boundary and build up strong electromagnetic field inside as a consequence the photoresponses of the nanowire at the specific wavelength or wavelength bands including absorption scattering and emission can be dramatically enhanced by tuning the nw diameter both the number of allowed lmrs in the nanowire and the spectral position of specific lmrs can be precisely controlled this size dependent tunability provides a powerful guidance for the rational design of photonic devices with desired spectral polarization response features the technological promise of this approach is illustrated in efficient germanium photodetectors in near infrared regime silicon solar cells with 250 enhancement in solar absorption efficiency and multicolored silicon nanostructures optical coupling between neighboring nanowires provides extra latitudes to manipulate light at the nanoscale the essence of the optical coupling lies in the exchange of photons between the nanowires much like the exchange of electrons between neighboring atoms in molecules experimentally it can be observed by monitoring the light scattering spectra of a bi nanowire structure that consists of two nanowires with similar diameter and parallel to each other by taking into account the leaky nature of optical modes in the nanowire resonator we propose a theoretical model coupled leaky mode theory clmt to account for the experimental observations and to point towards rational designs of complex nanostructures with desirable light matter interaction features for nanophotonic applications such as efficient transfer of optical power at the nanoscale through a chain of coupled nanowires overall these results represent the first systematic studies of optical resonances of semiconductor nanowires the demonstrated general existence of the lmrs and the coupled lmrs cast new light on semiconductor nanostructures and open up enormous opportunities to explore novel optical and optoelectronic

funtionalities in semiconductor nanostructures for photonics applications

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