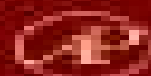


Light Emission in Silicon From Physics to Devices

Volume Editor

David J. Lockwood



SEMICONDUCTORS AND SEMIMETALS VOLUME 48

Thames Editors: Robert C. Millerstein and Bruce R. Nelson

From Physics To Devices Vol 49 Light Emissions In Silicon

**Stefano Ossicini, Lorenzo
Pavesi, Francesco Priolo**



From Physics To Devices Vol 49 Light Emissions In Silicon:

From Physics to Devices: Light Emissions in Silicon ,1997-11-14 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise indeed that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry

Light Emitting Silicon for Microphotonics Stefano Ossicini, Lorenzo Pavesi, Francesco Priolo, 2003-11-12 A fascinating insight into the state of the art in silicon microphotonics and on what we can expect in the near future The book presents an overview of the current understanding of getting light from silicon It concentrates mainly on low dimensional silicon structures like quantum dots wires and wells but covers also alternative approaches like porous silicon and the doping of silicon with rare earths The emphasis is on the experimental and theoretical achievements concerning the optoelectronic properties of confined silicon structures obtained during recent years Silicon based photonic crystals are in particular considered An in depth discussion of the route towards a silicon laser is presented **Laser**

Crystallization of Silicon - Fundamentals to Devices Norbert H. Nickel, 2003-12-12 This book on the Laser Crystallization of Silicon reviews the latest experimental and theoretical studies in the field It has been written by recognised global authorities and covers the most recent phenomena related to the laser crystallization process and the properties of the resulting polycrystalline silicon Reflecting the truly interdisciplinary nature of the field that the series covers this volume will continue to be of great interest to physicists chemists materials scientists and device engineers in modern industry Valuable applications for industry particularly in the fabrication of thin film electronics Each chapter has been peer reviewed An important and timely contribution to the semiconductor literature

Germanium Silicon: Physics and Materials ,1998-11-09 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently

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Silicon-based Microphotonics: from Basics to Applications Società italiana di fisica, 1999 The evolution of Si based optoelectronics has been extremely fast in the last few years and it is predicted that this growth will still continue in the near future The aim of the volume is to present different Si based luminescing materials as porous silicon rare earth doped silicon Si nanocrystals silicides Si based multilayers and silicon germanium alloy or superlattice structures The different devices needed for an all Si based optoelectronics are treated ranging from light sources to waveguides from amplifiers and modulators to detectors Both the very basic treatments as well as applications to real prototype devices and integration in an optical integrated circuit are presented Several issues are highlighted the problem of electrical transport in low dimensional Si systems the possibility of gain in Si based systems the low modulation speed of Si based LEDs The book gives a fascinating picture of the state of the art in Si microphotonics and a perspective on what one can expect in the near future

Nonlinear Optics in Semiconductors I, 1998-10-22 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry

Silicon Epitaxy, 2001-09-26 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer series as it is widely known has succeeded in producing numerous landmark volumes and chapters Not

only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded

Ultrafast Physical Processes in Semiconductors, 2000-10-06 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer series as it is widely known has succeeded in producing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded

Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry

Towards the First Silicon Laser Lorenzo Pavesi, Sergey Gaponenko, Luca Dal Negro, 2012-12-06 Silicon the leading material in microelectronics during the last four decades also promises to be the key material in the future Despite many claims that silicon technology has reached fundamental limits the performance of silicon microelectronics continues to improve steadily The same holds for almost all the applications for which Si was considered to be unsuitable The main exception to this positive trend is the silicon laser which has not been demonstrated to date The main reason for this comes from a fundamental limitation related to the indirect nature of the Si band gap In the recent past many different approaches have been taken to achieve this goal dislocated silicon extremely pure silicon silicon nanocrystals porous silicon Er doped Si Ge SiGe alloys and multiquantum wells SiGe quantum dots SiGe quantum cascade structures shallow impurity centers in silicon and Er doped silicon All of these are abundantly illustrated in the present book

Quantum Efficiency in Complex Systems, Part II: From Molecular Aggregates to Organic Solar Cells, 2011-11-23 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their

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Nonlinear Optics in Semiconductors II, 1998-11-09 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry

Conducting Organic Materials and Devices Suresh C. Jain, M. Willander, V. Kumar, 2011-08-09 Conducting polymers were discovered in 1970s in Japan Since this discovery there has been a steady flow of new ideas new understanding new conducting polymer organics structures and devices with enhanced performance Several breakthroughs have been made in the design and fabrication technology of the organic devices Almost all properties mechanical electrical and optical are important in organics This book describes the recent advances in these organic materials and devices

Semiconducting Chalcogenide Glass I Robert Fairman, Boris Ushkov, 2004-05-10 Chalcogenide glass is made up of many elements from the Chalcogenide group The glass is transparent to infrared light and is useful as a semiconductor in many electronic devices For example chalcogenide glass fibers are a component of devices used to perform laser surgery This book is a comprehensive survey of the current state of science and technology in the field of chalcogenide semiconductor glasses While the majority of the book deals with properties of chalcogenide glass chapters also deal with

industrial applications synthesis and purification of chalcogenide glass and glass structural modification The first individual or collective monograph written by Eastern European scientists known to Western readers regarding structural and chemical changes in chalcogenide vitreous semiconductors CVS Chapters written by B G Kolomiets who discovered the properties of chalcogenide glass in 1955 Provides evidence and discussion for problems discussed by authors from opposing positions

Electroluminescence II, 1999-10-29 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer series as it is widely known has succeeded in producing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry *Proceedings of the Third International Symposium on Defects in Silicon* Takao Abe, 1999

Electroluminescence I, 1999-10-28 The volume Electroluminescence for the first time covers almost all kinds of electroluminescence In its broadest sense electroluminescence is the conversion of electric power into optical power light The way in which this goal is accomplished and the goal the application itself has varied over time First reported in the scientific literature in 1936 by the French physicist G Destriau it was for quite some decades the glow of a powder embedded in a resin under the action of an alternating voltage The dream of cold light for illumination was born in the 50s Modern semiconductor technology using p n junction but not in silicon or germanium but in GaAs and GaP created in the 70s the tiny Light emitting Diodes Today about 50 for every human being have been sold They are everywhere for signaling and display of numbers and short texts And they are at the verge of an era of solid state lighting replacing gradually incandescent bulbs and fluorescent lamps In the first half of 1999 several joint ventures between giants of the lighting industry and manufacturers of LEDs became known including names as Philips General Electric Osram and Hewlett Packard Emtron and Siemens The reason blue light emission of LEDs for so long researched for unsuccessfully has been achieved Signaling lighting will be the domains of LEDs in the next decades a good start in the 21st millenium But at the same time a paradigm shift in the display industry could come about Dominated for the last 10 years by Liquid Crystal Displays LCD which are reflecting or transmitting light from extra light sources self emitting displays will challenge this dominance Capable of handling very

complex information by multiplexed addressing of millions of picture elements pixels in full color electroluminescence in the form of Organic LEDs and Thin Film Electroluminescence is gaining markets Both technologies much less matured than LED incorporate much different physical features The broad materials potential almost unexplored in both cases they are good for surprises The volume tries to present overviews over the 3 different technologies covering in each case the mechanisms the most important material properties essential for the implementation of the working principles the major applications and the system aspects The reader will learn how the new long life maintenance free power saving red traffic lights in the Silicon Valley function and what the tail lights of his next car will be The fascinating physics of polymer light emitters eventually manufactured in a roll to roll process for cellular phones or hand held wireless computers will become transparent And why is it that up to now only sulfides can be used for the simplest design of displays capable of proven multiplex ratios of 1000 The comparison of the different electroluminescences if this plural exists will hopefully give experts of one of the fields students of any of them and application engineers new insights and ideas Materials scientists and engineers will be caught by the comparison in analyzing what else one could provide to improve performance

Semiconducting Chalcogenide

Glass II Robert Fairman, Boris Ushkov, 2004-12-17 Chalcogenide glass is made up of many elements from the Chalcogenide group The glass is transparent to infrared light and is useful as a semiconductor in many electronic devices For example chalcogenide glass fibers are a component of devices used to perform laser surgery The properties of chalcogenide glass result not only from their chemical composition and atomic structure but also from the impact of numerous external factors A comprehensive survey is presented of the properties of chalcogenide glass under various external impacts Practical recommendations are presented for a wide range of applications Part II is the second part of a three volume work within the Semiconductors and Semimetals series The first collective monograph written by Eastern European scientists on the electrical and optical properties of chalcogenide vitreous semiconductors CVS Contributions by B G Kolomiets who discovered the properties of chalcogenide glass in 1955 Provides objective evidence and discussion by authors from opposing positions

Silicon Photonics M. Jamal Deen, Prasanta Kumar Basu, 2012-04-30 The creation of affordable high speed optical communications using standard semiconductor manufacturing technology is a principal aim of silicon photonics research This would involve replacing copper connections with optical fibres or waveguides and electrons with photons With applications such as telecommunications and information processing light detection spectroscopy holography and robotics silicon photonics has the potential to revolutionise electronic only systems Providing an overview of the physics technology and device operation of photonic devices using exclusively silicon and related alloys the book includes Basic Properties of Silicon Quantum Wells Wires Dots and Superlattices Absorption Processes in Semiconductors Light Emitters in Silicon Photodetectors Photodiodes and Phototransistors Raman Lasers including Raman Scattering Guided Lightwaves Planar Waveguide Devices Fabrication Techniques and Material Systems Silicon Photonics Fundamentals and Devices outlines the

basic principles of operation of devices the structures of the devices and offers an insight into state of the art and future developments

Identification of Defects in Semiconductors, 1998-10-27

GENERAL DESCRIPTION OF THE SERIES Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise indeed that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry

GENERAL DESCRIPTION OF THE VOLUME This volume has contributions on Advanced Characterization Techniques with a focus on defect identification The combination of beam techniques with electrical and optical characterization has not been discussed elsewhere

Hydrogen in Semiconductors II, 1999-05-05 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers 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 modern industry Provides the most in depth coverage of hydrogen in silicon available in a single source Includes an extensive chapter on the neutralization of defects in III b1V semiconductors Combines both experimental and theoretical studies to form a comprehensive reference

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