

Optical Switching in Low-Dimensional Systems

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Optical Switching In Low Dimensional Systems

IM Harris

Optical Switching In Low Dimensional Systems:

Optical Switching in Low-Dimensional Systems Hartmut Haug, L. Banyai, 2012-12-06 This book contains all the papers presented at the NATO workshop on Optical Switching in Low Dimensional Systems held in Marbella Spain from October 6th to 8th 1988 Optical switching is a basic function for optical data processing which is of technological interest because of its potential parallelism and its potential speed Semiconductors which exhibit resonance enhanced optical nonlinearities in the frequency range close to the band edge are the most intensively studied materials for optical bistability and fast gate operation Modern crystal growth techniques particularly molecular beam epitaxy allow the manufacture of semiconductor microstructures such as quantum wells quantum wires and quantum dots in which the electrons are only free to move in two one or zero dimensions of the optically excited electron hole pairs in these low respectively. The spatial confinement dimensional structures gives rise to an enhancement of the excitonic nonlinearities Furthermore the variations of the microstruture extensions of the compositions and of the doping offer great new flexibility in engineering the desired optical properties Recently organic chain molecules such as polydiacetilene which are different realizations of one dimensional electronic systems have been shown also to have interesting optical nonlinearities Both the development and study of optical and electro optical devices as well as experimental and theoretical investigations of the underlying optical nonlinearities are contained in this book **Lower-Dimensional Systems and Molecular Electronics** Robert M. Metzger, Peter R. Day, George C. Papavassiliou, 2013-11-11 This volume represents the written account of the NATO Advanced Study Institute Lower Dimensional Systems and Molecular Electronics held at Hotel Spetses Spetses Island Greece from 12 June to 23 June 1989 The goal of the Institute was to demonstrate the breadth of chemical and physical knowledge that has been acquired in the last 20 years in inorganic and organic crystals polymers and thin films which exhibit phenomena of reduced dimensionality The interest in these systems started in the late 1960 s with lower dimensional inorganic conductors in the early 1970 s with quasi one dimensional crystalline organic conductors which by 1979 led to the first organic superconductors and in 1977 to the fITSt conducting polymers The study of monolayer films Langmuir Blodgett films had progressed since the 1930 s but reached a great upsurge in the early 1980 s The pursuit of non linear optical phenomena became increasingly popular in the early 1980 s as the attention turned from inorganic crystals to organic films and polymers And in the last few years the term moleculw electronics has gained ever increasing acceptance although it is used in several contexts We now have organic superconductors with critical temperatures in excess of 10 K conducting polymers that are soluble and processable and used commercially we have films of a few monolayers that have high in plane electrical conductivity and polymers that show great promise in photonics we even have a few devices that function almost at the molecular level **Spectroscopy of Semiconductor Microstructures** Gerhard Fasol, Annalisa Fasolino, Paolo Lugli, 2013-06-29 Proceedings of a NATO ARW held in Venice Italy May 9 13 1989 Optical Switching Dalia Nandi, Sandip

Nandi, Angsuman Sarkar, Chandan Kumar Sarkar, 2022-07-06 OPTICAL SWITCHING Comprehensive coverage of optical switching technologies and their applications in optical networks Optical Switching Device Technology and Applications in Networks delivers an accessible exploration of the evolution of optical networks with clear explanations of the current state of the art in the field and modern challenges in the development of Internet of Things devices A variety of optical switches including MEMS based magneto photonic and SOA based are discussed as is the application of optical switches in networks The book is written in a tutorial style easily understood by both undergraduate and graduate students It describes the fundamentals and recent developments in optical switch networks and examines the architectural and design challenges faced by those who design and construct emerging optical switch networks as well as how to overcome those challenges The book offers ways to assess and analyze systems and applications comparing a variety of approaches available to the reader It also provides A thorough introduction to switch characterization including optical electro optical thermo optical magneto optical and acoustic optic switches Comprehensive explorations of MEMS based SOA based liquid crystal photonic crystal and optical electrical optical OEO switches Practical discussions of quantum optical switches as well as nonlinear optical switches In depth examinations of the application of optical switches in networks including switch fabric control and optical switching for high performance computing Perfect for researchers and professionals in the fields of telecommunications Internet of Things and optoelectronics Optical Switching Device Technology and Applications in Networks will also earn a place in the libraries of advanced undergraduate and graduate students studying optical networks optical communications *Light Scattering in Semiconductor Structures and Superlattices* D.J. Lockwood, Jeff F. and sensor applications Young, 2013-12-20 Just over 25 years ago the first laser excited Raman spectrum of any crystal was obtained In November 1964 Hobden and Russell reported the Raman spectrum of GaP and later in June 1965 Russell published the Si spectrum Then in July 1965 the forerunner of a series of meetings on light scattering in solids was held in Paris Laser Raman spectroscopy of semiconductors was at the forefront in new developments at this meeting Similar meetings were held in 1968 New York 1971 Paris and 1975 Campinas Since then and apart from the multidisciplinary biennial International Conference on Raman Spectroscopy there has been no special forum for experts in light scattering spectroscopy of semiconductors to meet and discuss latest developments Meanwhile technological advances in semiconductor growth have given rise to a veritable renaissance in the field of semiconductor physics Light scattering spectroscopy has played a crucial role in the advancement of this field providing valuable information about the electronic vibrational and structural properties both of the host materials and of heterogeneous composite structures On entering a new decade one in which technological advances in lithography promise to open even broader horizons for semiconductor physics it seemed to us to be an ideal time to reflect on the achievements of the past decade to be brought up to date on the current state of the art and to catch some glimpses of where the field might be headed in the 1990s Science and Engineering of One- and Zero-Dimensional

Semiconductors Steven P. Beaumont, Clivia M. Sotomayor Torres, 2012-12-06 This volume comprises the proceedings of the NATO Advanced Research Workshop on the Science and Engineering of 1 and O dimensional semiconductors held at the University of Cadiz from 29th March to 1st April 1989 under the auspices of the NATO International Scientific Exchange Program There is a wealth of scientific activity on the properties of two dimensional semiconductors arising largely from the ease with which such structures can now be grown by precision epitaxy techniques or created by inversion at the silicon silicon dioxide interface Only recently however has there burgeoned an interest in the properties of structures in which carriers are further confined with only one or in the extreme zero degrees of freedom This workshop was one of the first meetings to concentrate almost exclusively on this subject that the attendance of some forty researchers only represented the community of researchers in the field testifies to its rapid expansion which has arisen from the increasing availability of technologies for fabricating structures with small enough sub O I tm dimensions Part I of this volume is a short section on important topics in nanofabrication It should not be assumed from the brevity of this section that there is little new to be said on this issue rather that to have done justice to it would have diverted attention from the main purpose of the meeting which was to highlight experimental and theoretical research on the structures themselves Semiconductor-Laser Fundamentals Weng W. Chow, Stephan W. Koch, 2013-03-09 Since Fall of 1993 when we completed the manuscript of our book Semi conductor Laser Physics W W Chow S W Koch and M Sargent III Springer Berlin Heidelberg 1994 many new and exciting developments have taken place in the world of semiconductor lasers Novel laser and ampli fier structures were developed and others for example the VCSEL vertical cavity surface emitting laser and monolithic MOPA master oscillator power amplifier made the transition from research and development to production When investigating some of these systems we discovered instances when de vice performance and thus design depend critically on details of the gain medium properties e g spectral shape and carrier density dependence of the gain and refractive index New material systems were also introduced with optical emission wave lengths spanning from the mid infrared to the ultraviolet Particularly note worthy are laser and light emitting diodes based on the wide bandgap group III nitride and II VI compounds These devices emit in the visible to ultra violet wavelength range which is important for the wide variety of optoelectronic applications While these novel semiconductor laser materi als show many similarities with the more conventional near infrared systems they also possess rather different material parameter combinations. These differences appear as band structure modifications and as increased importance of Coulomb effects such that e g excitonic signatures resulting from the at tractive electron hole interaction are generally significantly more prominent in the wide bandgap systems

Point and Extended Defects in Semiconductors Giorgio Benedek, 2013-06-29 The systematic study of defects in semiconductors began in the early fifties FrQm that time on many questions about the defect structure and properties have been an swered but many others are still a matter of investigation and discussion Moreover during these years new problems arose in connection with the identification and char

acterization of defects their role in determining transport and optical properties of semiconductor materials and devices as well as from the technology of the ever in creasing scale of integration This book presents to the reader a view into both basic concepts of defect physics and recent developments of high resolution experimental techniques The book does not aim at an exhaustive presentation of modern defect physics rather it gathers a number of topics which represent the present time research in this field The volume collects the contributions to the Advanced Research Workshop Point Extended and Surface Defects in Semiconductors held at the Ettore Majo rana Centre at Erice Italy from 2 to 7 November 1988 in the framework of the International School of Materials Science and Technology The workshop has brought together scientists from thirteen countries Most participants are currently working on defect problems in either silicon submicron technology or in quantum wells and superlattices where point defects dislocations interfaces and surfaces are closely packed together

Mechanisms of Reactions of Organometallic Compounds with Surfaces D.J. Cole-Hamilton, J.O.

Williams, 2013-11-11 A NATO Advanced Research Workshop on the Mechanisms of Reactions of Organometallic Compounds with Surfaces was held in St Andrews Scotland in June 1988 Many of the leading international researchers in this area were present at the workshop and all made oral presentations of their results In addition significant amounts of time were set aside for Round Table discussions in which smaller groups considered the current status of mechanistic knowledge identified areas of dispute or disagreement and proposed experiments that need to be carried out to resolve such disputes so as to advance our understanding of this important research area All the papers presented at the workshop are collected in this volume together with summaries of the conclusions reached at the Round Table discussions The workshop could not have taken place without financial support from NATO and donations were also received from Associated Octel Ltd STC Ltd and Epichem Ltd for which the organisers are very grateful The organisation of the meeting was greatly assisted by Mrs G MacArthur and Mr L R Dunley of the Chemistry Department St Andrews University Resonant Tunneling in Semiconductors L.L. Chang, E.E. Mendez, C. Tejedor, 2012-12-06 This book contains the proceedings of the NATO Advanced Research Workshop on Resonant Tunneling in Semiconductors Physics and Applications held at Escorial Spain on May 14 18 1990 The tremendous growth in the past two decades in the field of resonant tunneling in semiconductor heterostructures has followed if not outpaced the expansion wit nessed in quantum structures in general Resonant tunneling shares also the multi disciplinary nature of that broad area with an emphasis on the underlying physics but with a coverage of material systems on the one end and device applications on the other Indeed that resonant tunneling provides great flexibility in terms of materials and configurations and that it is inherently a fast process with obvious device implications by the presence of a negative differential resistance have contributed to the unrelenting interest in this field These proceedings consist of 49 refereed articles they correspond to both invited and contributed talks at the workshop Because of the intertwinning nature of the subject matter it has been difficult to subdivide them in well defined sections Instead they are arranged in several

broad categories meant to serve only as guidelines of emphasis on different topics and aspects The book starts with an introduction to res onant tunneling by providing a perspective of the field in the first article This is fol lowed by discussions of different material systems with various band structure effects Quantum Mechanics with Applications to Nanotechnology and Information Science Yehuda B. Band, Yshai Avishai, 2013-01-10 Quantum mechanics transcends and supplants classical mechanics at the atomic and subatomic levels It provides the underlying framework for many subfields of physics chemistry and materials science including condensed matter physics atomic physics molecular physics quantum chemistry particle physics and nuclear physics It is the only way we can understand the structure of materials from the semiconductors in our computers to the metal in our automobiles It is also the scaffolding supporting much of nanoscience and nanotechnology The purpose of this book is to present the fundamentals of quantum theory within a modern perspective with emphasis on applications to nanoscience and nanotechnology and information technology As the frontiers of science have advanced the sort of curriculum adequate for students in the sciences and engineering twenty years ago is no longer satisfactory today Hence the emphasis on new topics that are not included in older reference texts such as quantum information theory decoherence and dissipation and on applications to nanotechnology including quantum dots wires and wells This book provides a novel approach to Quantum Mechanics whilst also giving readers the requisite background and training for the scientists and engineers of the 21st Century who need to come to grips with quantum phenomena The fundamentals of quantum theory are provided within a modern perspective with emphasis on applications to nanoscience and nanotechnology and information technology Older books on quantum mechanics do not contain the amalgam of ideas concepts and tools necessary to prepare engineers and scientists to deal with the new facets of quantum mechanics and their application to quantum information science and nanotechnology As the frontiers of science have advanced the sort of curriculum adequate for students in the sciences and engineering twenty years ago is no longer satisfactory today There are many excellent quantum mechanics books available but none have the emphasis on nanotechnology and quantum information science that this book has **Interacting Electrons in Reduced Dimensions** Dionys Baeriswyl, David K. Campbell, 2012-12-06 As its name suggests the 1988 workshop on Interacting Electrons in Reduced Dimen the wide variety of physical effects that are associated with possibly sions focused on strongly correlated electrons interacting in quasi one and quasi two dimensional mate rials Among the phenomena discussed were superconductivity magnetic ordering the metal insulator transition localization the fractional Quantum Hall effect QHE Peierls and spin Peierls transitions conductance fluctuations and sliding charge density CDW and spin density SDW waves That these effects appear most pronounced in systems of reduced dimensionality was amply demonstrated at the meeting Indeed when concrete illustrations were presented they typically involved chain like materials such as conjugated polymers inorganic CDW systems and organie conductors or layered materials such as high temperature copper oxide superconductors certain of the organic

superconductors and the OHE samples or devices where the electrons are confined to a restricted region of sample e g the depletion layer of a MOSFET To enable this broad subject to be covered in thirty five lectures and ab out half as many posters the workshop was deliberately focused on theoretical models for these phenomena and on methods for describing as faithfully as possible the true behav ior of these models This latter emphasis was especially important since the inherently many body nature of problems involving interacting electrons renders conventional effective single particle mean field methods e g Hartree Fock or the local density approxi mation in density functional theory highly suspect Again this is particularly true in reduced dimensions where strong quantum fluctuations can invalidate mean field results Magnetic Fluctuations in High-Temperature Superconductors George Reiter, Peter Horsch, Gregory C. Psaltakis, 2012-12-06 This NATO Advanced Research Workshop was held at a time when there was little consensus as to the mechanism for high temperature superconductivity in the context of a world undergoing major changes in its political alignments and sense of the possibility for the future It was characterized by generosity in the sharing of our uncertainties and speculations as was appropriate for both the subject matter and the context The workshop was organized of necessity around the experimental work as is this volume Where the theoretical work is directly relevant to particular experiments it is included in the appropriate sections with them Most of the participants felt strongly that magnetic fluctuations played an important role in the mechanism for high T c although with the exception of the IIS R work reported by Luke showing results inconsistent with the anyon picture and the work on flux phases by Lederer the mechanism remained an issue in the background A major focus was the phenomenological interpretation of the NMR data Scientific and Technical Aerospace Reports ,1995

Evaluation of Advanced Semiconductor Materials by Electron Microscopy David Cherns, 2012-12-06 The last few years have een rapid improvements in semiconductor growth techniques which have produced an expanding range of high quality heterostructures for new semiconductor devises As the dimensions of such structures approach the nanometer level it becomes increasingly important to characterise materials properties such as composition uniformity strain interface sharpness and roughness and the nature of defects as well as their influence on electrical and optical properties Much of this information is being obtained by electron microscopy and this is also an area of rapid progress There have been advances for thin film studies across a wide range of techniques including for example convergent beam electron diffraction X ray and electron energy loss microanalysis and high spatial resolution cathodoluminescence as well as by conventional and high resolution methods Important develop ments have also occurred in the study of surfaces and film growth phenomena by both microscopy and diffraction techniques With these developments in mind an application was made to the NATO Science Committee in late summer 1987 to fund an Advanced Research Work shop to review the electron microscopy of advanced semiconductors This was subsequently accepted for the 1988 programme and became the NATO Advanced Research Workshop on the Evaluation of Advanced Semiconductor Materials by Electron Microscopy The Workshop took place in the

pleasant and intimate surroundings of Wills Hall Bristol UK during the week 11 17 September 1988 and was attended by fifty five participants from fourteen countries <u>Ultrafast Photonics</u> A. Miller, D.T. Reid, D.M. Finlayson, 2019-08-22 Ultrafast photonics has become an interdisciplinary topic of high international research interest because of the spectacular development of compact and efficient lasers producing optical pulses with durations in the femtosecond time domain Present day long haul telecommunications systems are almost entirely based on the transmission of short burst Materials and Their Applications Enrique Rodríguez-Castellón, Sibele Pergher, 2019-05-27 This book is a special collection of articles dedicated to the preparation and characterization of nanoporous materials such as zeolitic type materials mesoporous silica SBA 15 MCM 41 and KIT 6 mesoporous metallic oxides metal organic framework structures MOFs and pillared clays and their applications in adsorption catalysis and separation processes. This book presents a global vision of researchers from international universities research centers and industries working with nanoporous materials and shares the latest results on the synthesis and characterization of such materials which have given rise to the special interest in their applications in basic and industrial processes Metallization and Metal-Semiconductor Interfaces Inder P. Batra.2012-12-06 This book represents the work presented at a NATO Advanced Research Workshop on Metallization and Metal Semiconductor Interfaces held at the Technical University of Munich Garching W Germany from 22 26 August 1988 The major focus of the workshop was to evaluate critically the progress made in the area of metal semiconductor interfaces The underlying theme was the mechanism of Schottky barrier formation and a serious as sessment of the various models A significant fraction of the workshop time was also spent in discussing the interaction of alkali metals with semiconductors Alkali metals on semi conductors form ordered overlayers and the resulting system often exhibits one dimensional metallic properties The nature of their interaction has introduced new and exciting com plexities and this was pursued at length during the lively discussions at the workshop A half a day was devoted to Scanning Tunneling Microscopy the emphasis being on its utility in providing structural and electronic character of low coverage regime. The book should pro vide readers with the most current status of the research activity in the general area of metal semiconductor interfaces at an international level It should also serve as an excellent introduction to the field since sufficient review type of material has also been included The workshop organizers Dr I P Batra Director mM Almaden Research Center San Jose Prof S Ciraci Bilkent University Ankara Prof C Y Pong University of California Davis Prof Dr F Koch Local Chairman Technical University Munich Garching Dr Η Silicon Photonics Lorenzo Pavesi, 2004-03-04 This book gives a fascinating picture of the state of the art in silicon photonics and a perspective on what can be expected in the near future It is composed of a selected number of reviews authored by world leaders in the field and is written from both academic and industrial viewpoints An in depth discussion of the route towards fully integrated silicon photonics is presented This book will be useful not only to physicists chemists materials scientists and engineers but also to graduate students who are interested in the fields of microphotonics and

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