Nonlinear Optics: Materials and Devices

Edited by C. Flytzanis and J. L. Oudar

Nonlinear Optics Materials And Devices Springer Proceedings In Physics Vol 7

Takayoshi Kobayashi

Nonlinear Optics Materials And Devices Springer Proceedings In Physics Vol 7:

Nonlinear Optics: Materials and Devices Christos Flytzanis,Jean L. Oudar,2012-12-06 The field of nonlinear optics has witnessed a tremendous evolution since its beginnings in the early sixties Its frontiers have been extended in many direc tions and its techniques have intruded upon many areas of both fundamental and practical interest The field itself has been enriched with many new phe nomena and concepts that have further extended its scope and strengthened its connection with other areas As a consequence it is becoming increasingly unrealistic to expect to cover the different facets and trends of this field in the lectures or proceed ings of a summer school however advanced these may be However much of the current progress and interest in this field springs to a large extent from the promise and expectation that highly performing all optical devices that exploit and operate on the principles of nonlinear optics will constitute an important branch of future technology and will provide new alternatives in information processing and transmission The conception of new devices in general requires an intricate and bold combination of facts and methods from most diverse fields in order to perform functions and operations that fit into an overall technological ensemble Nonlinear Surface Electromagnetic Phenomena H.-E. Ponath,G.I. Stegeman,2012-12-02 In recent years the physics of electromagnetic surface phenomena has developed rapidly evolving into technologies for communications and industry such as fiber and integrated optics The variety of phenomena based on electromagnetism at surfaces is rich and this book was written with the aim of summarizing the available knowledge in selected areas of the field The book contains reviews written by solid state and optical physicists on the nonlinear interaction of electromagnetic waves at and with surfaces and films Both the physical phenomena and some potential applications are dealt with Included are discussions of nonlinear wave mixing on films and surfaces second harmonic generation in waveguides and at surfaces nonlinear waves guided by dielectric and semiconductor surfaces and films surface gratings formed by high energy laser beams and reflection and transmission switching of strong beams onto nonlinear surfaces Chapters on light scattering from surface excitations and magnetic order disorder and orientational phase transitions complete this essential contribution to the modern optics literature **Physics of Amphiphilic Layers** Jacques Meunier,Dominique Langevin,Nino Boccara,2012-12-06 Amphiphilic layers play essential roles in the behaviour of a great variety of disperse systems such as micelles microemulsions and vesicles They can also exist as isolated mono or bilayers or constitute extended liquid crystalline structures Although the properties of these different systems may at first sight seem unrelated theoretical interpretations of them depend on several common concepts This was the reason for bringing together scientists working in this area for the International Winter School on the Physics of Amphiphilic Layers which was held at Les Houches 10 18 February 1987 The topics treated in the proceedings volume are mono and bilayers interactive forces between layers with special emphasis on steric forces ordered structures in particular swollen lamellar phases and defects vesicles micelles including polymer like systems microemulsions especially random bicontinuous structures and porous

media The importance of thermal fluctuations in the amphiphilic layers is stressed Recent results are presented and literature references allow readers not familiar with the subject to find any background information they require

Aerogels Jochen Fricke,2012-12-06 This book contains the papers presented at the First International Sympo st sium on Aerogels 1 ISA held in September 1985 at the University of Wiirzburg Fed Rep of Germany It was the first meet ing of this kind wit h participants from several European count ries the United States of America Canada South America and Africa The meeting was interdisciplinary with most of the participants being physicists chemists or material scientists ei ther from universities or from industrial research institutes Let me try to shed some light upon the class of substances the symposium was about Aerogels are extremely porous high tech materials consisting ei ther of silica alumina zirconia stannic or tungsten oxide or mixtures of these oxides Due to their high porosity up t o 99% and t heir large inner surface aerogels serve as especially active catalysts or as catalytic subst rates as adsorbents fillers reinforcement agents pigments and gellifying agents Silica aerogels as translucent or transparent superinsulating fillers in window systems could help to considerably reduce thermal losses in windows and to improve the energy balance in passive solar systems Aerogels also have fas cinating acoustic properties the sound velocity can be as low as 100 m s The production of aerogels starts with the controlled conversion of a sol into a gel The growth of clusters or polymer chains from a chemical solution the cross linking of these primary entities and the formation of a coherent network still embedded in a liquid **Quantum Optics IV** John D. Harvey,Daniel F. Walls,2012-12-06 This volume contains notes based on the lectures delivered at the fourth New Zealand Symposium in Laser Physics held at the University of Waikato Hamilton February 10 15 1986 At this meeting about 80 physicists work ing in many parts of the world met to discuss topics of current interest in contemporary laser physics and quantum optics These symposia which have been held triennially since 1977 have evolved into an important meet ing ground for experimentalists and theoreticians working in a very rapidly developing field As the format has evolved the number of participants in cluding the number from overseas has grown steadily and this year a poster session was included for the first time enabling a far greater range of topics to be discussed than was possible in the limited lecture time available At this meeting the major interest of the participants concerned the the oretical investigation of squeezed states of the radiation field and the very recently reported experimental observations of such states Other related ar eas of work reported here include bistability and chaotic behaviour of optical systems the quantum theory of measurements optical tests of general rel ativity and the current technological limitations governing the stabilization of lasers The editors would like to thank the participants for providing detailed notes for publication shortly after the meeting and the various organisa tions that have provided financial support *Electro-optic and Photorefractive Materials* Peter Günter,2012-12-06 This volume is based on lectures and contributed papers presented at the Eleventh Course of the International School of Materials Science and Tech nology that was held in Erice Sicily Italy at the Ettore Majorana Center for Scientific Culture during the period 6 17 July 1986

The subject of the course was Electro optic and Photorefractive Materials Applications in Sig nal Processing and Phase Conjugation The fields of electro optics and photorefraction have developed rapidly since the invention of lasers just over twenty five years ago The possibil of altering the optical properties of a material by electric fields or by ity optical waves is of great importance for both pure science and for practical applications such as optical signal processing telecommunications and opti cal display devices These effects allow us to manipulate modulate deflect and process a given light wave Modulation deflection and processing of light waves by means of the electro optic effect is of fundamental importance in fiber optic telecommuniC1 tions and sensor systems w here the light signals can be processed prior or subsequent to transmission through the fibers Thin film electro optic materials with suitable electrode arrays on the surface of the wave guiding structures result in a technology often referred to as inte grated optics In principle integrated optics devices allow miniaturization and integration of many operations onto a single chip The photorefractive effect defined as a photo induced change of the in dices of refraction was the other topic treated in this course **Primary Processes in Photobiology** Takayoshi Kobayashi,2012-12-06 Living things use solar energy in two ways in the transmission of information and in the conversion of light energy to chemical energy In order to elucidate the molecular mechanisms of highly sensitive visual responses and other photosensitive responses of biological systems and the very efficient transduction of photoenergy to chemical energy in photosynthesis it is important to observe molecular processes in biological systems Using highly developed laser spectroscopic techniques great progress has recently been achieved in the area of various primary processes in photobiology It was therefore an excellent time to hold the 12th Taniguchi International Symposium Biophysics Division on Primary Processes in Photobiology This volume is the proceedings of that symposium Among the topics discussed are the femtosecond molecular processes in photosynthetic bacteriochlorophyll and the recently discovered intermediates in the photocycles of rhodopsin found in the visual pigments of many animals bacteriorhodopsin found in the proton pumping pigments of halobacteria and retinochrome New techniques for the measurement of the primary processes are also reported

Recent Topics in Theoretical Physics Hajime Takayama,2012-12-06 My dear friends I am very pleased and honored to give the opening address in the first Nishinomiya Yukawa Memorial Symposium on Theoretical Physics Nishi nomiya City wishes to extend a warm and sincere welcome to the many participants here in this Symposium Nishinomiya is the city where Dr Hideki Yukawa 1907 1981 was living when he published the famous paper On the Interactions of Elementary Particles I in 1935 For this work he was awarded the Nobel Prize for Physics in 1949 To celebrate the 50th anniversary of his meson theory our city has started the Nishinomiya Yukawa Memorial Activities to promote the study of the oretical physics which we believe is important for the progress of human society The annual activities consist of this Symposium the Nishinomiya Yukawa Memorial Prize for promising young physicists and Memorial Lec tures for citizens every year They are conducted by the Steering Committee the chairman of which is Professor K Nishijima the director of the Research Institute for

Fundamental Physics Kyoto University I would like to express my sincere gratitude to the members of this Committee for their great efforts as well as to the members of the Organizing Committee of this Symposium Dr Yukawa said in his book Tabibito A traveler in Japanese One who inquires into the truth is just like a traveler without a map I shall be very happy and proud if this Symposium is successful and provides a useful map for many particularly for young physicists *Photons and Continuum States of Atoms and Molecules* Carla Guidotti,Maria Allegrini,2012-12-06 Since 1981 there has been an attempt in Europe to organize a series of small meetings workshops tavole rotonde with the aim of bringing together physi cists and chemists interested in problems concerning atoms or molecules in teracting with external photons where the continua are investigated The number of problems that fall into this category turns out to be vast However it is not possible to make a strict separation into problems con cerning atomic and molecular collisions and those related to the usual spec troscopy This admixture of two disciplines discussions on the role of photons and on the interaction of external electromagnetic fields with the continuum provided a central motivation for these workshops The fourth of this series of meetings was held at Cortona between June 16 and 20 1986 It was attended by about 100 researchers in the field and there were 43 presentations all having equal time These talks form the subject matter of this volume The idea of publishing the proceedings of these meetings is not new It allows one to have small meetings in which the subject matter can be discussed at length in a lively atmosphere However after the meeting is over the speakers can collect their thoughts and produce articles in which the results of their interaction with the other participants can be incorporated Lasers and Synergetics Robert Graham,Arne Wunderlin,2012-12-06 Lasers and Synergetics written to honour Hermann Haken on his 60th birthday is concerned with the two main areas of research to which Prof Haken has made fundamental contributions In fact the two areas are interrelated since the development of the interdisciplinary science synergetics has been closely connected with the emergence of laser theory Synergetics deals with complex systems that possess the fundamental property of spontaneous selforganization of their macroscopic behaviour The book summarizes basic ideas important concepts and principles used to describe selforganizing systems from a unified viewpoint Special attention is paid to lasers nonlinear optics and to coherence phenomena in other physical biological and sociological systems Some surveys of historical developments are presented but most space is devoted to the publication of recent results and the description of current research work The Physics and Fabrication of Microstructures and Microdevices Michael J. Kelly,Claude Weisbuch,2012-12-06 les Houches This Winter School on The Physics and Fabrication of Microstructures originated with a European industrial decision to investigate in some detail the potential of custom designed microstructures for new devices Beginning in 1985 GEC and THOMSON started a collaboration on these subjects supported by an ESPRIT grant from the Commission of the European Com munity To the outside observer of the whole field it appears clear that the world effort is very largely based in the United States and Japan It also appears that cooperation and dissemination of results are very well organised outside Europe and act as a major

influence on the development of new concepts and devices In Japan a main research programme of the Research and Development for Basic Technology for Future Industries is focused on Future Electron Devices In Japan and in the United States many workshops are organised annually in order to bring together the major specialists in industry and academia allowing fast dissemination of advances and contacts for setting up cooperative efforts **Gas Flow and Chemical Lasers** Salman Rosenwaks,2012-12-06 The Sixth International Symposium on Gas Flow and Chemical Lasers GCL was held in Jerusalem Israel on September 8 12 1986 The charm and beauty of Jerusalem and the unique blending of ancient and modern made this Symposium an enjoyable experience for the 165 participants and the accompanying persons Yet it seems that the invited and contributed papers presented at the Symposium were equally attractive so that most of the participants attended most sessions resisting the temptations outside the session hall Indeed many speakers presented up to date results that were obtained or cleared just a few days before the Symposium This volume is a compi lation of 19 invited and 61 contributed papers and of a panel discussion on the prospects for short wavelength chemical lasers held at the closing session of the Symposium This discussion is presented as recorded in order to re tain the flavour of spontaneous presentation at the risk or advantage of presenting some venturous ideas and the danger of misquoting In editing the book a deductive approach has been attempted The book starts with some fundamental issues namely fluid dynamics and optics and then deals with the design diagnostics propagation and applications of various gas laser systems covering the wavelength spectrum from XUV to infrared Then follow recent developments of general interest to the laser community and the book concludes with an eye to the future i e with a section on short wavelength chemical lasers **Quantum Aspects of Molecular Motions in Solids** Anton Heidemann,Andreas Magerl,Michael Prager,Dieter Richter,Tasso Springer,2012-12-06 The Institut Max von Laue Paul Langevin ILL in Grenoble regularly orga nizes workshops that deal with various applications of neutrons in physics chemistry biology and materials science The workshop Quantum Aspects of Molecular Motions in Solids was jointly organized by the Institut Laue Langevin and the Institut fiir Festkorperforschung at the Kernforschungsan lage Jiilich and took place in September 1986 in Grenoble Tunneling phenomena in molecular crystals were first observed with macro scopic methods like specific heat experiments and later also with NMR Fi nally the development of high resolution neutron scattering techniques like neutron backscattering led to direct spectroscopic observation of the tunnel split ground state This breakthrough was achieved in 1975 at Jiilich Since then the large variety of high resolution techniques available in combination with high neutron flux have turned ILL into the leading laboratory in the field of tunneling spectroscopy Since 1980 regular meetings of scientists involved in this topic have been organized every two years Jiilich Braunschweig Nottingham and have led to an intense exchange of ideas and experimental results The present workshop is the fourth of this series and the first with published proceedings presenting the state of the art in this field The eight review articles introduce scientists not involved in the subject to the actual discussion Sessions on translational tunneling of light interstitials in metals as well as on

tunneling phenomena in amorphous substances provide bridges to adjacent fields *Optical Bistability III* Hyatt M. Gibbs,Paul Mandel,Nasser Peyghambarian,S. Desmond Smith,2012-12-06 This is a collection of papers presented at the Topical Meeting on Optical BistabiJity OB3 held December 2 4 1985 in Tucson Arizona The increase in attendance to almost 200 shows that interest continues to grow in the sub ject of optical bistability OB and its wider implications both in application to optical digital computing and to basic physics notably instabilities and spatial effects The maturing of the field is evidenced by the fact that the number of experimental papers has caught up with the number of theoretical ones These trends were already apparent in OB2 and the 1984 Royal Society Meeting on Optical Bistabilty Dynamical Nonlinearity and Photonic Logic Progress in experiment al topics included guided wave OB mostly ther mal picol econd switching studies on quite a number of new materials op tical computing and pattern recognition using arrays of nonlinear etalons Theoretical progress ranged from rather practical calculations on device per formance noise effects on switching and transverse and longitudinal spatial effects to fundamental studies of dynamics instabilities and chaos The Conference also included both theoretical ideas on optical computer archit ecture and intrinsic OB circuit elements such as as full adder as well as t he first demonstration of an intrinsic optical circuit in the form of a cas cadable loop with bufferd st ores A first demostration of a simple pattern recognition algorithm using 2 D arrays of spots on a ZnSe int erference filter was reported **Magnetic Excitations and Fluctuations II** Umberto Balucani,Stephen W. Lovesey,Mario G. Rasetti,Valerio Tognetti,2012-12-06 An international workshop on Elementary Excitations and Fluctuations in Magnetic Systems was held in Turin for five days beginning 25 May 1987 The workshop followed much the same format as the one with the same title held in San Miniato in 1984 proceedings Springer Series in Solid State Sciences Vol 54 that most participants contributed talks and provided papers for the proceedings While many of the participants had attended the first workshop 15 of the 40 invited review papers were presented by scientists who had not The majority of the talks reported theoretical work concerned with the introduction of new techniques However experimental work was also well represented not least because many of the reported theoretical studies were motivated by experimental findings and a highlight of the workshop was an extremely stimulating session devoted to recent neutron scattering measure ments on various systems that exploited polarization analysis The fine venue of the workshop Villa Gualino with its excellent facili ties and spacious accommodation helped to produce a delightful relaxed and friendly atmosphere For the use of Villa Gualino and significant financial support we are indebted to our host organization the Institute for Scien tific Interchange lSI Additional financial support came from the Consiglio Nazionale delle Ricerche CNR Centro Interuniversitario di Struttura della Material del Ministero della Pubblica Istruzione CISM MPI and Gruppo Nazionale di Struttura della Materia GNSM CNR **Semiconductor Interfaces: Formation and Properties** Guy LeLay,Jacques Derrien,Nino Boccara,2012-12-06 The trend towards miniaturisation of microelectronic devices and the search for exotic new optoelectronic devices based on multilayers confer a crucial role on semiconductor interfaces Great advances

have recently been achieved in the elaboration of new thin film materials and in the characterization of their interfacial properties down to the atomic scale thanks to the development of sophisticated new techniques This book is a collection of lectures that were given at the International Winter School on Semiconductor Interfaces Formation and Properties held at the Centre de Physique des Rouches from 24 February to 6 March 1987 The aim of this Winter School was to present a comprehensive review of this field in particular of the materials and methods and to formulate recom mendations for future research The following topics are treated i Interface formation The key aspects of molecular beam epitaxy are emphasized as well as the fabrication of artificially layered structures strained layer superlattices and the tailoring of abrupt doping profiles ii Fine characterization down to the atomic scale using recently devel oped powerful techniques such as scanning tunneling microscopy high reso lution transmission electron microscopy glancing incidence x ray diffraction x ray standing waves surface extended x ray absorption fine structure and surface extended energy loss fine structure iii Specific physical properties of the interfaces and their prospective applications in devices We wish to thank warmly all the lecturers and participants as well as the organizing committee who made this Winter School a success **Directory of Published Proceedings** ,1997 **Nonlinear Optics** S. Miyata,2012-12-02 The field of nonlinear optics developed gradually with the invention of lasers After the discovery of second harmonic generation in quartz many other interesting nonlinear optical processes were rapidly discovered Simultaneously theoretical programmes for the understanding of nonlinear optical phenomena were stimulated in accordance to develop structure property relationships In the beginning research advances were made on inorganic ferroelectric materials followed by semiconductors In the 1970 s the importance of organic materials was realised because of their nonlinear optical responses fast optical response high laser damage thresholds architectural flexibility and ease of fabrication At present materials can be classified into three categories inorganic ferroelectrics semiconductors and organic materials Advances have also been made in quantum chemistry approaches to investigate nonlinear optical susceptibilities and in the development of novel nonlinear optical devices Generally inorganic and organic nonlinear optical materials and their related optical processes are reported in separate meetings This book collects for the first time papers covering the recent developments and areas of present research in the field of nonlinear optical materials

Nonlinear Optics in Signal Processing R.W. Eason,A. Miller,2012-12-06 Nonlinear Optics in Signal Processing covers the applications of nonlinear optics to optical processing in a range of areas including switching computing and telecommunications *Universalities in Condensed Matter* Remi Jullien,Luca Peliti,Rammal Rammal,Nino Boccara,2012-12-06 Universality is the property that systems of radically different composition and structure exhibit similar behavior The appearance of universal laws in simple critical systems is now well established experimentally but the search for universality has not slackened This book aims to define the current status of research in this field and to identify the most promising directions for further investigations On the theoretical side numerical simulations and analytical arguments have

led to expectations of universal behavior in several nonequilibrium systems e g aggregation electric discharges and viscous flows Experimental work is being done on geometric phase transitions e g aggregation and gelation in real systems The contributions to this volume allow a better understanding of chaotic systems turbulent flows aggregation phenomena fractal structures and quasicrystals They demonstrate how the concepts of renormalization group transformations scale invariance and multifractality are useful for describing inhomogeneous materials and irreversible phenomena

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