Introduction To Nonlinear Optical Effects In Molecules And Polymers

Nonlinear Optical Properties of Organic Molecules and Crystals, Volume 1 discusses the nonlinear optical effects in organic molecules and crystals, providing a classical distinction between quadratic and cubic processes. This book begins with a general overview of the basic properties of organic matter, followed by a review on the benefits derived from quantum-chemistry-based models and growth and characterization of high quality, bulk organic crystals and waveguided structures. A case study focusing on a specific material, namely urea, which exemplifies a situation in which transparency in the UV region has been purposely traded for nonlinear efficiency is also deliberated. This text concludes with a description of a type of trade-off between the unpredictable orientation of molecules in crystalline media, polarity of liquid-crystalline structures, and dominant electronic contribution to the electro-optic effect. This publication is beneficial to solid-state physicists and chemists concerned with nonlinear optical properties of organic molecules and crystals.

Ferroelectricity is a symptom of inevitable electrical polarization changes in materials without external electric field interference. Ferroelectricity is a phenomenon exhibited by crystals with a spontaneous polarization and hysteresis effects associated with dielectric changes when an electric field is given. Our fascination with ferroelectricity is in recognition of a beautiful article by Itskovsky, in which he explains the kinetics of a ferroelectric phase transition in a thin ferroelectric layer (film). We have been researching ferroelectric materials since 2001. There

are several materials known for their ferroelectric properties. Barium titanate and barium strontium titanate are the most well known. Several others include tantalum oxide, lead zirconium titanate, gallium nitride, lithium tantalate, aluminium, copper oxide, and lithium niobate. There is still a blue ocean of ferroelectric applications yet to be expounded. It is and hopefully always will be a bright future.

The development of new highly nonlinear fibers - referred to as microstructured fibers, holey fibers and photonic crystal fibers - is the next generation technology for all-optical signal processing and biomedical applications. This new edition has been thoroughly updated to incorporate these key technology developments. The book presents sound coverage of the fundamentals of lightwave technology, along with material on pulse compression techniques and rare-earth-doped fiber amplifiers and lasers. The extensively revised chapters include information on fiber-optic communication systems and the ultrafast signal processing techniques that make use of nonlinear phenomena in optical fibers. New material focuses on the applications of highly nonlinear fibers in areas ranging from wavelength laser tuning and nonlinear spectroscopy to biomedical imaging and frequency metrology. Technologies such as quantum cryptography, quantum computing, and quantum communications are also covered in a new chapter. This book will be an ideal reference for: R&D engineers working on developing next generation optical components; scientists involved with research on fiber amplifiers and lasers; graduate students and researchers working in the fields of optical communications and quantum information. The only book on how to develop nonlinear fiber optic applications Two new chapters on the latest developments; Highly Nonlinear Fibers and Quantum Applications Coverage of biomedical applications

Explores the Fundamental Aspects of Nonlinear Optics As nonlinear optics further develops as a field of research in electromagnetic wave propagation, its state-of-the-art technologies will continue to strongly impact real-world applications in a variety of fields useful to the practicing scientist and engineer. From basic principles to examples of applications, Nonlinear Optics: Principles and Applications effectively bridges physics and mathematics with relevant applied material for real-world use. The book progresses naturally from fundamental aspects to illustrative examples, and presents a strong theoretical foundation that equips the reader with enough knowledge to recognize, understand, and evaluate nonlinear optical phenomena. Structured so that the first five chapters are dedicated to the description of the fundamental formalism of nonlinear optics, and the last five chapters are devoted to a description of practical devices based on nonlinear phenomena, it describes nonlinear wave propagation in bulk and in waveguiding structures, and includes specific examples of applied nonlinear wave propagation through crystals, optical waveguides, and optical fibers. Providing a theoretical description of nonlinear interaction between light and matter, this text focuses on the physical understanding of nonlinear optics, and explores optical material response functions in the time and frequency domain. This pivotal work contains ten chapters and the main applications include: Optical signal processing: parametric amplification, modulators Transmission of optical signals: optical solitons, cross-phase modulation, four-wave mixing, phase conjugation, Raman scattering Sensing: temperature sensors, spectroscopy, and imaging Lasers: pulse compression and generation of super continuum Nonlinear Optics: Principles and Applications describes the fundamental aspects of nonlinear optics and serves as a reference for nonlinear optics professionals as well as graduate students specializing in nonlinear optics.

This book will provide insight into the principles and applications of nonlinear effects in fibers for students, researchers, and developers who have a basic understanding of electromagnetic theory under their belts. It will explore the physics, limitations, applications, and research results surrounding nonlinear effects in fiber optics. In addition to communications, optical fibers are already used in medical procedures, automobiles, and aircraft and are expected to have many other applications. This will expand the range of industry workers who will find a book of this type useful.

Organic Nonlinear Optical Materials provides an extensive description of the preparation and characterization of organic materials for applications in nonlinear and electro-optics. The book discusses the fundamental optimization and practical limitations of a number of figures of merit for various optical parameters and gives a clinical appraisal of the potential of organic materials for applicators in optical technology. Among the topics addressed are the basic molecular design of ;nonlinear optical chromophores, fundamentals and novel techniques of organic crystal growth, preparation and characterization of Langmuir-Blodgett and polymer films, experimental methods for determining microscopic and macroscopic optical properties. Also included is a discussion of first results of the photorefractive effect in organic crystals and the potential of organics for photorefractive applications, as well as an extensive review of published linear and nonlinear optical measurement of organic materials.

Examining classic theories, experimental methods, and practical formulas for exploration of the core topics in nonlinear optics, the second edition of this acclaimed text was extensively revised to reflect recent advances in the analysis and modification of material properties for application in frequency conversion, optical switching and limiting,

Investigating the chemistry and physics of complex systems, this text focuses on the role of spatial restrictions on molecular movement. It covers topics including motions of excitations, multilayers and porous glasses, photoreactions, nuclear magnetic resonance and orientational dynamics.

This book is based on tried and tested courses taught by the author, George Stegeman, who is one of the experimental pioneers in nonlinear optics. The book starts with second order phenomena, goes on to explain the derivation of nonlinear susceptibilities, and finishes with a thorough discussion of third order nonlinear effects. Included is a simple "electron on a spring" model which helps readers begin their journey through the field of nonlinear optics.

Praise for the 1st Edition: "well written and up to date.... The problem sets at the end of each chapter reinforce and enhance the material presented, and may give students confidence in handling real-world problems." ?Optics & Photonics News "rigorous but simple description of a difficult field keeps the reader's attention throughout.... serves perfectly for an introductory-level course." ?Physics Today This fully revised introduction enables the reader to understand and use the basic principles related to many phenomena in nonlinear optics and provides the mathematical tools necessary to solve application-relevant problems. The book is a pedagogical guide aimed at a diverse audience including engineers, physicists,

and chemists who want a tiered approach to understanding nonlinear optics. The material is augmented by numerous problems, with many requiring the reader to perform real-world calculations for a range of fields, from optical communications to remote sensing and quantum information. Analytical solutions of equations are covered in detail and numerical approaches to solving problems are explained and demonstrated. The second edition expands the earlier treatment and includes: A new chapter on quantum nonlinear optics. Thorough treatment of parametric optical processes covering birefringence, tolerances and beam optimization to design and build high conversion efficiency devices. Treatment of numerical methods to solving sets of complex nonlinear equations. Many problems in each chapter to challenge reader comprehension. Extended treatment of four-wave mixing and solitons. Coverage of ultrafast pulse propagation including walk-off effects.

Introduction to Nonlinear Laser Spectroscopy focuses on the principles of nonlinear laser spectroscopy. This book discusses the experimental techniques of nonlinear optics and spectroscopy. Comprised of seven chapters, this book starts with an overview of the stimulated Raman effect and coherent anti-Stokes Raman spectroscopy, which can be used in a varied way to generate radiation in the ultraviolet and vacuum-ultraviolet areas. This text then explains the simplest

quantum-mechanical system consisting of an isolated entity with energy eigenstates |b> and |a> having energies Eb and Ea (Eb > Ea), respectively. Other chapters examine the exciting possibilities started by saturated absorption and related techniques, including improved spectroscopic precision, studies of collisional dynamics, and better measurements of fundamental constants and of basic units. The final chapter deals with the method of infrared spectrophotography, which combines efficient detection, time resolution, and coherent infrared. Spectroscopists and graduate students will find this book extremely useful.

With this book, we aim to capture different perspectives of researchers on nonlinear optics and optical devices and we intend to cover the latest developments in optics from theoretical, numerical, and experimental aspects. The eleven selected chapters cover a variety of topics related to nonlinear optics including bright, dark, kink solitary waves in various media, magnetic solitons, lattice solitons, rogue-waves, solid-state lasers, laser cladding, optical sensors, optical vortices, and molecular switches. The book is intended to draw the attention of scientists in academia, as well as researchers and engineers in industry, since the field has a significant potential for the production and design of novel optical devices and other technological applications.

Since the early days of nonlinear optics in the 1960s, the field has expanded dramatically, and is now a vast and vibrant field with countless technological applications. Providing a gentle introduction to the principles of the subject, this textbook is ideal for graduate students starting their research in this exciting area. After basic ideas have been outlined, the book offers a thorough analysis of second harmonic generation and related second-order processes, before moving on to third-order effects, the nonlinear optics of short optical pulses and coherent effects such as electromagnetically-induced transparency. A simplified treatment of high harmonic generation is presented at the end. More advanced topics, such as the linear and nonlinear optics of crystals, the tensor nature of the nonlinear coefficients and their quantum mechanical representation, are confined to specialist chapters so that readers can focus on basic principles before tackling these more difficult aspects of the subject.

Nonlinear optics is a rapidly developing field of modern physics. Nonlinear optical phenomena such as self-focusing, self-phase modulation, soliton formation and propagation, higher harmonic generation, different types of stimulated light scattering, and four-wave mixing have attracted interest from the fundamental point of view of the investigation of light/matter interaction, and as a basis for applications in contemporary optical communications and optical signal

processing. Nonlinear Optics - Novel Results in Theory and Applications contains novel results concerning the mathematical methods of nonlinear optical phenomena analysis, soliton formation and propagation in optical fibers, and peculiarities of nonlinear optical phenomena in micro- and nanostructures. The book may be interesting for researchers and engineers interested in nonlinear optics, lasers, and optical communications.

Nonlinear Optics probes in great depth quadratic and cubic nonlinearities, photorefractive nonlinear optics, the nonlinear optical properties of nematic liquid crystals, and photonic bandgap structures. This reference places core physical principles and theoretical concepts in dialogue with contemporary applications and research and presents

Presents a clear systematic molecular-based description of nonlinear optical polarization analysis of chemical and biological assemblies.

Contemporary Nonlinear Optics discusses the different activities in the field of nonlinear optics. The book is comprised of 10 chapters. Chapter 1 presents a description of the field of nonlinear guided-wave optics. Chapter 2 surveys a new branch of nonlinear optics under the heading optical solitons. Chapter 3 reviews recent progress in the field of optical phase conjugation. Chapter 4 discusses ultrafast nonlinear optics, a field that is growing rapidly with the ability of

generating and controlling femtosecond optical pulses. Chapter 5 examines a branch of nonlinear optics that may be termed nonlinear quantum optics. Chapter 6 reviews the new field of photorefractive adaptive neural networks. Chapter 7 presents a discussion of recent successes in the development of nonlinear optical media based on organic materials. Chapter 8 reviews the field of nonlinear optics in quantum confined structures. Chapter 9 reviews the field of nonlinear laser spectroscopy, with emphasis on advances made during the 1980s. Finally, Chapter 10 reviews the field of nonlinear optical dynamics by considering nonlinear optical systems that exhibit temporal, spatial, or spatio-temporal instabilities. This book is a valuable source for physicists and other scientists interested in optical systems and neural networks.

Nonlinear optics is a topic of much current interest that exhibits a great diversity. Some publications on the subject are clearly physics, while others reveal an engineering bias; some appear to be accessible to the chemist, while others may appeal to biological understanding. Yet all purport to be non linear optics so where is the underlying unity? The answer is that the unity lies in the phenomena and the devices that exploit them, while the diversity lies in the materials used to express the phenomena. This book is an attempt to show this unity in diversity by bringing together contributions covering an unusually wide range of materials,

preceded by accounts of the main phenomena and important devices. Because ofthe diversity, individual materials are treated in separate chapters by different expert authors, while as editors we have shouldered the task of providing the unifying initial chapters. Most main classes of nonlinear optical solids are treated: semiconductors, glasses, ferroelectrics, molecular crystals, polymers, and Langmuir-Blodgett films. (However, liquid crystals are not covered.) Each class of material is enough for a monograph in itself, and this book is designed to be an introduction suitable for graduate students and those in industry entering the area of nonlinear optics. It is also suitable in parts for final-year undergraduates on project work. It aims to provide a bridge between traditional fields of expertise and the broader field of nonlinear optics.

This is a monograph/text devoted to a detailed treatment of the optical, electro-optical and nonlinear optical properties of all the mesophases of liquid crystals and related processes, phenomena and application principles. Quantitative data on material and optical parameters spanning the ultraviolet, visible, infrared as well as the microwave regimes are presented along with detailed theoretical treatments of basic liquid crystal physics, material properties and nonlinear optics.Starting with a discussion on the basic building blocks of liquid crystalline molecules, the authors proceed to present in a pedagogical manner current

theories, experiments, and applications of these unique and important optical properties of liquid crystals. Numerous tables of hard-to-find liquid crystalline parameters, a self-contained chapter on general nonlinear optics, and comprehensive literature review are also included.

The most comprehensive book on waveguide nonlinear optic devices, this volume presents a systematic description of the NLO field, with an emphasis on devices that use ferroelectric waveguides. It ranges from an introduction to the concepts of waveguides to the most recent experimental results.

This book covers many advances in the subjects of nano-optics and nano photonics. The author describes the principle and technical schematics of common methods for breaking through the optical diffraction limit and focuses on realizing optical super-resolution with nonlinear effects of thin film materials. The applications of nonlinear optical super-resolution effects in nano-data storage, nanolithography, and nano-imaging are also presented. This book is useful to graduate students majoring in optics and nano science and also serves as a reference book for academic researchers, engineers, technical professionals in the fields of super-resolution optics and laser techniques, nano-optics and nano photonics, nano-data storage, nano imaging, micro/nanofabrication and nanolithography and nonlinear optics.

Although chemists, biochemists, biologists, and material scientists are often interested in using nonlinear optical techniques for characterizing their samples, they seldom have the necessary background to exploit these methods. Designed for nonspecialists, Second-Order Nonlinear Optical Characterization Techniques: An Introduction focuses on the potential of second-order nonlinear optics as a powerful characterization tool. Avoiding extensive mathematical details, this multidisciplinary book does not require a background in advanced mathematics or physics. After introducing linear optics from the perspective of polarizability and linear susceptibility, the authors cover incoherent second-harmonic generation. They then deal with the study of surfaces and interfaces, exploiting the intrinsic surface sensitivity of second-harmonic generation and sum-frequency generation. The final chapter discusses second-order imaging techniques, including confocal microscopy and two-photon excited fluorescence microscopy. Accessible to a wide range of scientists, this concise book stresses the reliability of nonlinear optical processes for probing surfaces and interfaces. Drawing on the insight offered in the text, scientists from many disciplines can now clearly understand and use second-order nonlinear optical methods. This book provides a comprehensive presentation of the major topics in nonlinear optics and photonics, including the latest progress and cutting-edge

achievements. Chapters 1-10 present the fundamentals of modern nonlinear optics, and could therefore be adopted as a textbook with problems provided at the end of each chapter. Chapters 11-17 cover the advanced topics of techniques and applications of nonlinear optics and photonics, and may serve as a highlyinformative reference for researchers and experts working in related areas.

This book reflects the latest advances in nonlinear optics. Besides the simple, strict mathematical deduction, it also discusses the experimental verification and possible future applications, such as the all-optical switches. It consistently uses the practical unit system throughout. It employs simple physical images, such as "light waves" and "photons" to systematically explain the main principles of nonlinear optical effects. It uses the first-order nonlinear wave equation in frequency domain under the condition of "slowly varying amplitude approximation" and the classical model of the interaction between the light and electric dipole. At the same time, it also uses the rate equations based on the energy-level transition of particle systems excited by photons and the energy and momentum conservation principles to explain the nonlinear optical phenomenon. The book is intended for researchers, engineers and graduate students in the field of optics, optoelectronics, fiber communication, information technology and

materials etc.

Susceptibility Tensors for Nonlinear Optics is a unique and invaluable reference book with accompanying software. Starting from basic principles, the book presents a detailed introduction to the concept of optical susceptibilities of crystalline media. Substantial appendices include useful tables of third-, fourth-, and fifth-rank susceptibility tensors for major nonlinear optical effects. Integral to the book is an entirely original TURBO RANK software package (compatible with PCs running MS-DOS and Windows) that allows the calculation of the symmetry of material tensors up to seventh rank, effectively superseding conventional reference tables of high rank tensors. This package is also useful for scientists working in solid state physics, crystallography, acoustics, and materials engineering.

Although the basic principles of lasers have remained unchanged in the past 20 years, there has been a shift in the kinds of lasers generating interest. Providing a comprehensive introduction to the operating principles and applications of lasers, this second edition of the classic book on the subject reveals the latest developments and applications of lasers. Placing more emphasis on applications of lasers and on optical physics, the book's self-contained discussions will appeal to physicists, chemists, optical scientists, engineers, and advanced undergraduate students.

Many years spent in an industrial engineering laboratory have convinced me that there is ever-increasing need to present recent and current research in forms which can be easily assimilated by engineers, technical managers, and others concerned with applications and the development of new tech nology. There is a forbidding gap between the typical research paper, addressed by specialists to other specialists, and the popular-level account addressed

to the layman. The second does not adequately prepare the engi neer for profitably studying the first; it does not impart sufficient depth of understanding to the manager who must make decisions on the relative merits of various approaches to a problem or on the potential contributions various specialists might make to his program. This book is the outgrowth of a review prepared to fill this need for engineers in a large corporation who were concerned with the industrial application of lasers. That review was written hurriedly, on a fixed budget, to a deadline; consequently, it contained oversimplifications and errors, not all of which were trivial. Nevertheless, the favorable response proved that such a review is indeed needed. It is hoped that this more finished work will prove useful to a wide variety of potential users of laser-centered devices and systems, and may even stimulate the generation of useful ideas. Molecular Dynamics in Restricted Geometries Edited by Joseph Klafter and J. M. Drake This investigation of the chemistry and physics of complex systems focuses on the role of spatial restrictions on molecular movement. A practical source-book for researchers in chemical physics, chemical engineering, and condensed matter physics, and for graduate students in these fields, it covers a broad range of topics and critically evaluates methods as they are employed. Among the many topics it covers are: relaxation and diffusion in restricted geometries, excitation energy transfer and photoinduced electron transfer phenomena in some confined systems, electron excitation transport in micelles, polymers and multilayers, and electron excitation transport on polymer chains. 1989 (0 471-60176-4) 437 pp. By recirculating light in a nonlinear propagation medium, the nonlinear optical cavity allows for countless options of light transformation and manipulation. In passive media, optical bistability and frequency conversion are central figures. In active media, laser light can be generated with

versatile underlying dynamics. Emphasizing on ultrafast dynamics, the vital arena for the information technology, the soliton is a common conceptual keyword, thriving into its modern developments with the closely related denominations of dissipative solitons and cavity solitons. Recent technological breakthroughs in optical cavities, from micro-resonators to ultra-long fiber cavities, have entitled the exploration of nonlinear optical dynamics over unprecedented spatial and temporal orders of magnitude. By gathering key contributions by renowned experts, this book aims at bridging the gap between recent research topics with a view to foster cross-fertilization between research areas and stimulating creative optical engineering design. Nonlinear optical materials play a pivotal role in the future evolution of nonlinear optics in general and its impact in technology and industrial applications in particular. The progress in nonlinear optics has been tremendous since the first demonstration of an all-optical nonlinear effect in the early sixties, but until recently the main visible emphasis was on the physical aspects of the nonlinear radiation matter interaction. In the last decade, however, this effort has also brought its fruits in applied aspects of nonlinear optics. This can be essentially traced to the improvement of the performances of the nonlinear optical materials. Our understanding of the nonlinear polarization mechanisms and their relation to the structural characteristics of the materials has been considerably improved. In addition, the new development of techniques for the fabrication and growth of artificial materials has dramatically contributed to this evolution. The goal is to find and develop materials presenting large nonlinearities and satisfying at the same time all the technological requirements for applications such as wide transparency range, fast response, high damage threshold but also processability, adaptability and interfacing with other materials. Improvements, besides rendering possible the

implementation of nonlinear effects in devices, open the way to the study of new nonlinear optical effects and the introduction of new concepts. This book describes new concepts which are emerging in the field of nonlinear optical materials, concentrating the attention on materials which seem more promising for applications in the technology of information transmission and processing.

This self-contained treatment of field quantization requires no prior knowledge of nonlinear optics. Supplemented by end-of-chapter exercises and detailed examples of calculation techniques in different systems, it is a valuable resource for graduate students and researchers in nonlinear optics, condensed matter physics, quantum information and atomic physics.

A complete basic undergraduate course in modern optics for students in physics, technology, and engineering. The first half deals with classical physical optics; the second, quantum nature of light. Solutions.

Following the birth of the laser in 1960, the field of "nonlinear optics" rapidly emerged. Today, laser intensities and pulse durations are readily available, for which the concepts and approximations of traditional nonlinear optics no longer apply. In this regime of "extreme nonlinear optics," a large variety of novel and unusual effects arise, for example frequency doubling in inversion symmetric materials or high-harmonic generation in gases, which can lead to attosecond electromagnetic pulses or pulse trains. Other examples of "extreme nonlinear optics" cover diverse areas such as solid-state physics, atomic physics,

relativistic free electrons in a vacuum and even the vacuum itself. This book starts with an introduction to the field based primarily on extensions of two famous textbook examples, namely the Lorentz oscillator model and the Drude model. Here the level of sophistication should be accessible to any undergraduate physics student. Many graphical illustrations and examples are given. The following chapters gradually guide the student towards the current "state of the art" and provide a comprehensive overview of the field. Every chapter is accompanied by exercises to deepen the reader's understanding of important topics, with detailed solutions at the end of the book. Nanoplasmonics is a young topic of research, which is part of nanophotonics and nano-optics. Nanoplasmonics concerns to the investigation of electron oscillations in metallic nanostructures and nanoparticles. Surface plasmons have optical properties, which are very interesting. For instance, surface plasmons have the unique capacity to confine light at the nanoscale. Moreover, surface plasmons are very sensitive to the surrounding medium and the properties of the materials on which they propagate. In addition to the above, the surface plasmon resonances can be controlled by adjusting the size, shape, periodicity, and materials' nature. All these optical properties can enable a great number of applications, such as biosensors, optical modulators, photodetectors, and

photovoltaic devices. This book is intended for a broad audience and provides an overview of some of the fundamental knowledges and applications of nanoplasmonics.

The field of nonlinear optics emerged three decades ago with the development of the first operating laser and the demonstration of frequency doubling phenomena. These milestone discoveries not only generated much interest in laser science, but also set the stage for future work on nonlinear optics. This book presents an excellent overview of the exciting new advances in nonlinear optical (NLO) materials and their applications in emerging photonics technologies. It is the first reference source available to cover every NLO material published through 1995. All theoretical approaches, measurement techniques, materials, technologies, and applications are covered. With more than 1,800 bibliographic citations, 324 figures, 218 tables, and 812 equations, this book is an invaluable reference source for graduate and undergraduate students, researchers, scientists and engineers working in academia and industries in chemistry, solid-state physics, materials science, optical and polymer engineering, and computational science.

This comprehensive and didactic overview explores the nonlinear effects from a physical point of view and discusses the implications for signal capacity. Enriched

with practical considerations and experimental results, the book offers special chapters dealing with applications of nonlinear effects for signal processing, ultrafast-optical switching, wavelength conversion, nonlinear amplification, and optical phase-conjugation. Equipped with chapter-end summaries and problems, this valuable reference can also serve as a graduate-level textbook.

This book is a self-contained account of the most important principles of nonlinear optics. Assuming a familiarity with basic mathematics, the fundamentals of nonlinear optics are developed from the basic concepts, introducing and explaining the essential quantum mechanical apparatus as it arises. Later chapters deal with the materials used and the constructions that are necessary to induce the effects.

This book addresses fabrication as well as characterization and modeling of semiconductor nanostructures in the optical regime, with a focus on nonlinear effects. The visible range as well as near and far infrared spectral region will be considered with a view to different envisaged applications. The book covers the current key challenges of the research in the area, including: exploiting new material platforms, fully extending the device operation into the nonlinear regime, adding re-configurability to the envisaged devices and proposing new modeling tools to help in conceiving new functionalities. • Explores several topics in the

field of semiconductor nonlinear nanophotonics, including fabrication, characterization and modeling of semiconductor nanostructures in the optical regime, with a focus on nonlinear effects • Describes the research challenges in the field of optical metasurfaces in the nonlinear regime • Reviews the use and achievements of all-dielectric nanoantennas for strengthening the nonlinear optical response • Describes both theoretical and experimental aspects of photonic devices based on semiconductor optical nanoantennas and metasurfaces • Gathers contributions from several leading groups in this research field to provide a thorough and complete overview of the current state of the art in the field of semiconductor nonlinear nanophotonics Costantino De Angelis has been full professor of electromagnetic fields at the University of Brescia since 1998. He is an OSA Fellow and has been responsible for several university research contracts in the last 20 years within Europe, the United States, and Italy. His technical interests are in optical antennas and nanophotonics. He is the author of over 150 peer-reviewed scientific journal articles. Giuseppe Leo has been a full professor in physics at Paris Diderot University since 2004, and in charge of the nonlinear devices group of MPQ Laboratory since 2006. His research areas include nonlinear optics, micro- and nano-photonics, and optoelectronics, with a focus on AlGaAs platform. He has

coordinated several research programs and coauthored 100 peer-reviewed journal articles, 200 conference papers, 10 book chapters and also has four patents. Dragomir Neshev is a professor in physics and the leader of the experimental photonics group in the Nonlinear Physics Centre at Australian National University (ANU). His activities span over several branches of optics, including nonlinear periodic structures, singular optics, plasmonics, and photonic metamaterials. He has coauthored 200 publications in international peer-reviewed scientific journals.

Describing progress achieved in the field of nonlinear optics and nonlinear optical materials, the Handbook treats selected topics such as photorefractive materials, third-order nonlinear optical materials and organic nonlinear optical crystals, as well as electro-optic polymers. Applications of photorefractive materials in optical memories, optical processing, and guided-wave nonlinear optics in hotorefractive waveguides are described. As light will play a more and more dominant role as an information carrier, the review of existing and new materials given here makes this a keystone book in the field.

""Furnishes table of nonlinear optical properties of organic substances as well as experimental procedures for measuring the nonlinearity of the elements tabulated, including composite materials-offering support for scientists and

engineers involved in characterizing, optimizing, and producing materials for manufacturing optical devices.

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