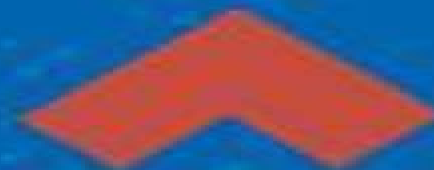
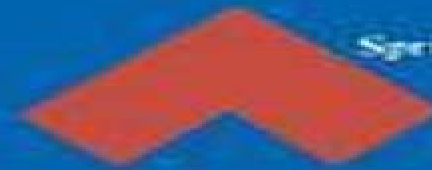


PHOTOREFRACTIVE EFFECTS AND MATERIALS

David D. Nolte



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Photorefractive Effects And Materials

David D. Nolte



Photorefractive Effects And Materials:

Photorefractive Effects and Materials David D. Nolte, 2013-11-27 The photorefractive effect is now firmly established as one of the highest sensitivity nonlinear optical effects making it an attractive choice for use in many optical holographic processing applications. As with all technologies based on advanced materials, the rate of progress in the development of photorefractive applications has been principally limited by the rate at which breakthroughs in materials science have supplied better photorefractive materials. The last ten years have seen an upsurge of interest in photorefractive applications because of several advances in the synthesis and growth of new and sensitive materials. This book is a collection of many of the most important recent developments in photorefractive effects and materials. The introductory chapter which provides the necessary tools for understanding a wide variety of photorefractive phenomena is followed by seven contributed chapters that offer views of the state of the art in several different material systems. The second chapter represents the most detailed study to date on the growth and photorefractive performance of BaTiO₃, one of the most important photorefractive ferroelectrics. The third chapter describes the process of permanently fixing holographic gratings in ferroelectrics, important for volumetric data storage with ultra high data densities. The fourth chapter describes the discovery and theory of photorefractive spatial solitons. Photorefractive polymers are an exciting new class of photorefractive materials described in the fifth chapter. Polymers have many advantages primarily related to fabrication that could promise a breakthrough to the marketplace because of ease and low cost of manufacturing.

Photorefractive Materials and Their Applications 1 Peter Günter, Jean Pierre Huignard, 2006-04-09 This is the first volume of a set of three within the Springer Series in Optical Sciences and is devoted to photorefractive effects, photorefractive materials and their applications. Since the publication of our first two Springer books on Photorefractive Materials and Their Applications Topics in Applied Physics Vols 61 and 62 almost 20 years ago, a lot of research has been done in this area. New and often expected effects have been discovered, theoretical models developed, known effects finally explained, and novel applications proposed. We believe that the field has now reached a high level of maturity, even if research continues in all areas mentioned above and with new discoveries arriving quite regularly. We therefore have decided to invite some of the top experts in the field to put together the state of the art in their respective fields. This, after we had been encouraged to do so for more than ten years by the publisher, due to the fact that the former volumes were long out of print.

Photorefractive Effects and Materials David D. Nolte, 2014-09-01

Photorefractive Materials and Their Applications 2 Peter Günter, Jean Pierre Huignard, 2007-11-13 This second volume of the series on photorefractive effects focuses on the most recent developments in the field and highlights the parameters which govern the photoinduced nonlinearity. Besides reviewing conventional electro-optic crystals, this book deals with organic photorefractive materials, giving an in-depth assessment of the present understanding of the effect in a variety of materials. The materials considered in this volume will play a significant role in the development of applications such as

presented in the third volume Nonlinear Optical Effects and Materials Peter Günter, 2012-12-06 It is now well established that a unique feature of coherent optical beams is their ability to transmit process store and interconnect in parallel a large number of high bandwidth information channels However although these techniques possess great potential their development depends critically on the nonlinear optical effects used and on the availability of nonlinear optical materials that work at high speed and low incident optical power At present these requirements are stimulating a great deal of research in materials science and are challenging existing technologies in particular high speed electronics This volume devoted to nonlinear optical effects and materials presents a detailed account of selected topics in inorganic and organic materials research The status of organic crystals and polymers for nonlinear optics is critically compared with their inorganic counterparts The preparation techniques and a description of the methods used to characterize the nonlinear optical effects relevant for device applications are dealt with as well as a theoretical description of the nonlinear optical electro optical and photorefractive effects observed The main concepts and potential applications are outlined and developed in the various chapters of this book This collection of articles provides a broad survey of selected research topics in organic and inorganic nonlinear optics *Photovoltaic and Photo-refractive Effects in Noncentrosymmetric Materials* Boris I. Sturman, Vladimir M. Fridkin, 2021-03-10 Ferroelectric materials in addition to possessing the unique property of a reversible spontaneous polarization exhibit a range of other significant and useful properties These include high values of piezoelectric pyroelectric nonlinear optic electrooptic photorefractive and dielectric permittivity coefficients Another fascinating property of ferroelectric materials is their photovoltaic effect Photovoltaic effects have been extensively studied in the past in symmetric materials such as silicon This volume is the first concentrated treatment of the characteristics theory and potential applications of the photovoltaic effect in noncentrosymmetric materials which include ferroelectrics and piezoelectrics The book also deals with the relationship between the photovoltaic and the photorefractive effects The latter has already been well studied and is finding many applications in optical processing and computing This volume should prove to be an important text as well as a comprehensive reference source for basic and applied researchers working on photovoltaic photorefractive and other photoeffects in ferroelectrics and related materials **Photorefractive Materials** G. Roosen, F. Agulló-López, O.F. Schirmer, 2013-10-22 The papers presented here reflect the core of the scientific activities that took place at the 1994 E MRS conference The contributions indicate that the field of photorefractive materials is advancing vigorously moving into new classes of compounds finding ways for the judicious tailoring of the microscopic properties of the materials based on increased insight into the features of defects or quantum wells and leading to new applications often made possible by the advances at the forefront of the materials The many papers presented by European participants emphasised the large amount of work being carried out here Stimulating contributions also came from the United States and Japan while papers presented by members from the industrial world indicate the importance of the field in this sector *Photorefractive*

Materials and Their Applications, 2006 *Photorefractive Materials and Their Applications II* Peter Günter, Jean-Pierre Huignard, 2014-03-12 This is the second of two volumes that review for the first time all major aspects of photorefractive effects and their applications Photorefractive effects in electro optic crystals are based on optically induced space charge fields which ultimately alter the refractive indices by the electro optic Pockels effect The fundamental phenomena leading to photoinduced changes of refractive index the materials requirements and experimental results on a variety of photorefractive materials are discussed and the most recent theoretical models describing these phenomena are presented Interest in photorefractive materials has increased in recent years mainly because of their potential for nonlinear optical devices and for optical signals processing applications Most of these applications are reviewed in this volume The contributions to the two volumes are written by experts on each topic and are intended for scientists and engineers active in the field and for researchers and graduate students entering the field Over 300 references to original papers on photorefractive and associated phenomena are cited Volume 1 appeared as Volume 61 of Topics in Applied Physics *Photorefractive Materials and Their Applications I* Peter Günter, Jean-Pierre Huignard, 2014-03-12 This is the first of two volumes that review for the first time all major aspects of photorefractive effects and their applications Photorefractive effects in electro optic crystals are based on optically induced space charge fields which ultimately alter the refractive indices by the electro optic Pockels effect The fundamental phenomena leading to photoinduced changes of refractive index the materials requirements and experimental results on a variety of photorefractive materials are discussed and the most recent theoretical models describing these phenomena are presented Interest in photorefractive materials has increased in recent years mainly because of their potential for nonlinear optical devices and for optical signals processing applications Most of these applications are reviewed in the second volume devoted to this topic The contributions to these two volumes are written by experts on each topic and are intended for scientists and engineers active in the field and for researchers and graduate students entering the field Over 300 references to original papers on photorefractive and associated phenomena are cited

Nonlinear Optical Materials: Principles and Applications Società italiana di fisica, 1995 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

Photorefractive Materials and Their Applications I
Peter Günter, Jean-Pierre Huignard, 1988-04-08 This is the first of two volumes that review for the first time all major aspects of photorefractive effects and their applications Photorefractive effects in electro optic crystals are based on optically induced space charge fields which ultimately alter the refractive indices by the electro optic Pockels effect The fundamental phenomena leading to photoinduced changes of refractive index the materials requirements and experimental results on a variety of photorefractive materials are discussed and the most recent theoretical models describing these phenomena are presented Interest in photorefractive materials has increased in recent years mainly because of their potential for nonlinear optical devices and for optical signals processing applications Most of these applications are reviewed in the second volume devoted to this topic The contributions to these two volumes are written by experts on each topic and are intended for scientists and engineers active in the field and for researchers and graduate students entering the field Over 300 references to original papers on photorefractive and associated phenomena are cited

Organic Nonlinear Optical Materials Ch. Bosshard, 2020-04-23 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

Insulating Materials For Optoelectronics: New Developments Fernando Agullo-lopez, Carmen N Afonso, William M Yen, David Levy, O F Schirmer, Reiner Vianden, L E Bausa, A Kling, M F Da Silva, Thomas Gog, Hans Donnerberg, Carolina Medrano, M P De Micheli, Yu N Korkishko, P Bassi, Paolo Mazzoldi, Giancarlo C Righini, Peter D Townsend, Ernesto Dieguez, P Olmos, 1995-11-07 This review volume presents new developments in the preparation physical characterization and applications of insulating materials for Optoelectronics Insulators occupy a leading position as laser and optical amplifier hosts electrooptic and acoustooptic modulators frequency doublers and optical parametric oscillators photorefractive devices and radiator detectors These applications rely heavily on the development of advanced techniques for the preparation of both bulk and waveguide structures the adequate knowledge of the microscopic behaviour defects impurities and a thorough understanding of their response to electromagnetic fields All these topics relating basic physicochemical aspects and applied performance are authoritatively discussed in the book

Photorefractive Materials and Their Applications 1 Peter Günter, Jean Pierre Huignard, 2010-11-25 This is the first volume of a set of three within the

Springer Series in Optical Sciences and is devoted to photorefractive effects photorefractive materials and their applications Since the publication of our first two Springer books on Photorefractive Materials and Their Applications Topics in Applied Physics Vols 61 and 62 almost 20 years ago a lot of research has been done in this area New and often expected effects have been discovered theoretical models developed known effects finally explained and novel applications proposed We believe that the field has now reached a high level of maturity even if research continues in all areas mentioned above and with new discoveries arriving quite regularly We therefore have decided to invite some of the top experts in the field to put together the state of the art in their respective fields This after we had been encouraged to do so for more than ten years by the publisher due to the fact that the former volumes were long out of print **Ferroelectric Materials** Aimé

Peláiz-Barranco,2015-07-29 Ferroelectric materials receive great attention from the scientific international community because of the interesting phenomena they exhibit and their multiple applications such as transducers capacitors pyroelectric sensors sonars random access memories etc The demand for ferroelectric materials for technological applications enforced the in depth research in addition to the improvement of processing and characterization techniques This book contains nine chapters and offers the results of several researches covering fabrication properties theoretical topics and phenomena at the nanoscale *Advances in Nonlinear Optics* Xianfeng Chen,Guoquan Zhang,Heping Zeng,Qi Guo,Weilong She,2014-12-16 This book presents an overview of the state of the art of the developing topic of nonlinear optics with contributions from leading experts in the field in China ranging from weak light nonlinear optics ultrafast nonlinear optics to electro optical theory and applications In the past decade nonlinear optics has evolved into many different branches depending on the form of the material used for studying the nonlinear phenomena The growth of research in nonlinear optics is closely linked to the rapid technological advances that have occurred in related fields such as ultra fast phenomena and optical communications Nonlinear optics activities range from the fundamental studies of the interaction between matter and radiation to the development of devices components and systems of tremendous commercial interest for widespread applications in optical telecommunications medicine and biotechnology This book reviews the development of some nonlinear optics researches in China not only the discovery of new principles but also potential applications of nonlinear optics for various industries **The Handbook of Photonics** Mool C. Gupta,John Ballato,2018-10-03 Reflecting changes in the field

in the ten years since the publication of the first edition The Handbook of Photonics Second Edition explores recent advances that have affected this technology In this new updated second edition editor Mool Gupta is joined by John Ballato strengthening the handbook with their combined knowledge and the continued contributions of world class researchers New in the Second Edition Information on optical fiber technology and the economic impact of photonics Coverage of emerging technologies in nanotechnology Sections on optical amplifiers and polymeric optical materials The book covers photonics materials devices and systems respectively An introductory chapter new to this edition provides an overview of photonics

technology innovation and economic development Resting firmly on the foundation set by the first edition this new edition continues to serve as a source for introductory material and a collection of published data for research and training in this field making it the reference of first resort *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 Technology 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 Signal Processing and Phase Conjugation The fields of electro optics and photorefractive have developed rapidly since the invention of lasers just over twenty five years ago The possibility of altering the optical properties of a material by electric fields or by its optical waves is of great importance for both pure science and for practical applications such as optical signal processing telecommunications and optical 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 telecommunications and sensor systems where 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 integrated 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 indices of refraction was the other topic treated in this course *Advances in Optics, Vol. 1* Sergey Yurish,2018-04-22 The Vol 1 devoted to various topics of optics and optic instrumentation and contains 17 chapters written by 36 experts in the field from 15 countries Brazil China Denmark France Germany India Japan Mexico Russia Turkey Slovenia South Korea UK Ukraine and USA *Advances in Optics Reviews Book Series* is a comprehensive study of the field of optics which provides readers with the most up to date coverage of optics photonics and lasers with a good balance of practical and theoretical aspects Directed towards both physicists and engineers this Book Series is also suitable for audiences focusing on applications of optics A clear comprehensive presentation makes these books work well as both a teaching resource and a reference book The book is intended for researchers and scientists in physics and optics in academia and industry as well as postgraduate students

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