Introduction To Micro And Nanooptics By Jahns Ji 1 2 Rgen Helfert Stefan Wiley Vch 2012 Paperback Paperback

This book introduces graduate students in physics, optics, materials science and electrical engineering to surface plasmons, and applications of surface plasmon physics.

This book highlights some of the latest advances in nanotechnology and nanomaterials from leading researchers in Ukraine, Europe and beyond. It features contributions presented at the 8th International Science and Practice Conference Nanotechnology and Nanomaterials (NANO2020), which was held on August 26–29, 2020 at Lviv Polytechnic National University, and was jointly organized by the Institute of Physics of the National Academy of Sciences of Ukraine, University of Tartu (Estonia), University of Turin (Italy), and Pierre and Marie Curie University (France). Internationally recognized experts from a wide range of universities and research institutions share their knowledge and key findings on material properties, behavior, and synthesis. This book’s companion volume also addresses topics such as nano-optics, energy storage, and biomedical applications.

As in all nonlinear optics, control over the spatial phase of the fundamental light fields allows extensive influence on the well-established effect of High-Har monic Generation (HHG). This results in the realisation of coherent extreme ultraviolet (XUV) light with unique properties. Christian Kern shows and discusses in his thesis two schemes where phase shaping of ultrashort laser pulses is appli ed on scales below their fundamental wavelength. He shows the limitations of how nanoplasmonic objects can be administered for strong field physics. Furthermore, a novel approach of producing XUV light carrying orbital angular momentum via HHG is demonstrated and experimentally verified.

Proceedings of SPIE present the original research papers presented at SPIE conferences and other high-quality conferences in the broad-ranging fields of optics and photonics. These books provide prompt access to the latest innovations in research and technology in their respective fields. Proceedings of SPIE are among the most cited references in patent literature.

This reference informs readers about nanoscale design and synthesis of different nanomaterials. Chapters of the book account for variable nanoarchitecture, while explaining concepts which are central to the field of nanotechnology. It explains how nanodevices and microdevices can be used for nanophotonics, biophotonics and drug delivery applications. Advanced biochemical techniques ranging from fluorescence, plasmonics, enhanced plasmonics (EP) to metal enhanced fluorescence (MEF) from colloidal dispersion to single luminescent nanoplatforms and nanospectroscopy, microfluidics,

nanofluidics, silica wave-guiding, lasers, nanolasers and photonic circuits for enhanced signal detections are also presented. In addition, proof of concept ideas of microdevices and nanodevices to real applications within other allied disciplines such as genomics, biochemistry, drug delivery and clinical chemistry (based on advanced optical detection and imaging) are highlighted. The book is an informative reference for readers studying biochemistry, pharmacology, biomedical engineering and related subjects at all levels, as well as general readers who want to learn about advanced applications in optics and photonics.

Nanophotonics is where photonics merges with nanoscience and nanotechnology, and where spatial confinement considerably modifies light propagation and light-matter interaction. Describing the basic phenomena, principles, experimental advances and potential impact of nanophotonics, this graduate-level textbook is ideal for students in physics, optical and electronic engineering and materials science. The textbook highlights practical issues, material properties and device feasibility, and includes the basic optical properties of metals, semiconductors and dielectrics. Mathematics is kept to a minimum and theoretical issues are reduced to a conceptual level. Each chapter ends in problems so readers can monitor their understanding of the material presented. The introductory quantum theory of solids and size effects in semiconductors are considered to give a parallel discussion of wave optics and wave mechanics of nanostructures. The physical and historical interplay of wave optics and quantum mechanics is traced. Nanoplasmonics, an essential part of modern photonics, is also included.

Expectations of a technological revolution are associated with nanotechnology, and indeed the generation, modification and utilization of objects with tiniest dimensions already permeates science and research in a way that the absence of nanotechnology is no longer conceivable. It has progressed to an independent interdisciplinary field, its great success due to the purposeful combination of physical, mechanical and molecular techniques. This book starts out with the most important fundamentals of microtechnology and chemistry on which the understanding of shaping nanoscale structures are based, then a variety of examples illustrate the fabrication of nanostructures from different materials. Subsequently, methods for characterization of the generated structures are presented to the reader. Through this fascinating introduction, both scientists and engineers gain insights into the "other side" of nanotechnology.

This book gives a comprehensive introduction to Green’s function integral equation methods (GFIEMs) for scattering problems in the field of nano-optics. First, a brief review is given of the most important theoretical foundations from electromagnetics, optics, and scattering theory, including theory of waveguides, Fresnel reflection, and scattering, extinction, and absorption cross sections. This is followed by a presentation of different types of GFIEMs of increasing complexity for one-, two-, and three-dimensional scattering problems. In GFIEMs, the electromagnetic field at any

position is directly related to the field at either the inside or the surface of a scattering object placed in a reference structure. The properties of the reference structure, and radiating or periodic boundary conditions, are automatically taken care of via the choice of Green's function. This book discusses in detail how to solve the integral equations using either simple or higher-order finite-element-based methods; how to calculate the relevant Green's function for different reference structures and choices of boundary conditions; and how to calculate near-fields, optical cross sections, and the power emitted by a local source. Solution strategies for large structures are discussed based on either transfer-matrix-approaches or the conjugate gradient algorithm combined with the Fast Fourier Transform. Special attention is given to reducing the computational problem for three-dimensional structures with cylindrical symmetry by using cylindrical harmonic expansions. Each presented method is accompanied by examples from nano-optics, including: resonant metal nano-particles placed in a homogeneous medium or on a surface or waveguide; a microstructured gradient-index-lens; the Purcell effect for an emitter in a photonic crystal; the excitation of surface plasmon polaritons by second-harmonic generation in a polymer fiber placed on a thin metal film; and anti-reflective, broadband absorbing or resonant surface microstructures. Each presented method is also accompanied by guidelines for software implementation and exercises. Features Comprehensive introduction to Green's function integral equation methods for scattering problems in the field of nano-optics Detailed explanation of how to discretize and solve integral equations using simple and higher-order finite-element approaches Solution strategies for large structures Guidelines for software implementation and exercises Broad selection of examples of scattering problems in nano-optics

blends materials, fabrication, and structure issues of developing nanobio devices in a single volume. treats major nanobio application areas such as drug delivery, molecular diagnostics, and imaging. chapters written by the leading researchers in the field.

This book recalls the basics required for an understanding of the nanoworld (quantum physics, molecular biology, micro and nanoelectronics) and gives examples of applications in various fields: materials, energy, devices, data management and life sciences. It is clearly shown how the nanoworld is at the crossing point of knowledge and innovation. Written by an expert who spent a large part of his professional life in the field, the title also gives a general insight into the evolution of nanosciences and nanotechnologies. The reader is thus provided with an introduction to this complex area with different "tracks" for further personal comprehension and reflection. This guided and illustrated tour also reveals the importance of the nanoworld in everyday life.

Miniaturization and mass replications have begun to lead the optical industry in the transition from traditional analog to novel digital optics. As digital optics enter the realm of mainstream technology through the worldwide sale of consumer electronic devices, this timely book aims to present the topic of digital optics in a unified way. Ranging from micro-optics to nanophotonics, and design to fabrication through to integration in final products, it reviews the various physical implementations of digital optics in either micro-

refractives, waveguide (planar lightwave chips), diffractive and hybrid optics or sub-wavelength structures (resonant gratings, surface plasmons, photonic crystals and metamaterials). Finally, it presents a comprehensive list of industrial and commercial applications that are taking advantage of the unique properties of digital optics. Applied Digital Optics is aimed primarily at optical engineers and product development and technical marketing managers; it is also of interest to graduate-level photonics students and micro-optic foundries. Helps optical engineers review and choose the appropriate software tools to design, model and generate fabrication files. Gives product managers access to an exhaustive list of applications available in today's market for integrating such digital optics, as well as where the next potential application of digital optics might be. Provides a broad view for technical marketing managers in all aspects of digital optics, and how such optics can be classified. Explains the numerical implementation of optical design and modelling techniques. Enables micro-optics foundries to integrate the latest fabrication and replication techniques, and accordingly fine tune their own fabrication processes.

This book offers the first comprehensive introduction to the optical properties of the catenary function, and includes more than 200 figures. Related topics addressed here include the photonic spin Hall effect in inhomogeneous anisotropic materials, coupling of evanescent waves in complex structures, etc. After familiarizing readers with these new physical phenomena, the book highlights their applications in plasmonic nanolithography, flat optical elements, perfect electromagnetic absorbers and polarization converters. The book will appeal to a wide range of readers: while researchers will find new inspirations for historical studies combining mechanics, mathematics, and optics, students will gain a wealth of multidisciplinary knowledge required in many related areas. In fact, the catenary function was deemed to be a "true mathematical and mechanical form" in architecture by Robert Hooke in the 1670s. The discovery of the mathematical form of catenaries is attributed to Gottfried Leibniz, Christiaan Huygens and Johann Bernoulli in 1691. As the founders of wave optics, however, Hooke and Huygens did not recognize the importance of catenaries in optics. It is only in recent decades that the link between catenaries and optics has been established.

This book presents the latest results of quantum properties of light in the nanostructured environment supporting surface plasmons, including waveguide quantum electrodynamics, quantum emitters, strong-coupling phenomena and lasing in plasmonic structures. Different approaches are described for controlling the emission and propagation of light with extreme light confinement and field enhancement provided by surface plasmons. Recent progress is reviewed in both experimental and theoretical investigations within quantum plasmonics, elucidating the fundamental physical phenomena involved and discussing the realization of quantum-controlled devices, including single-photon sources, transistors and ultra-compact circuitry at the nanoscale.

"From the beginning of this century, there has been a dramatic increase in interest in the study of surface plasmon polaritons-based metallic subwavelength structures and learning. This is a refreshing concise book on issues and considerations in designing"

This first textbook on both micro- and nanooptics introduces readers to the technological development, physical background and

key areas. The opening chapters on the physics of light are complemented by chapters on refractive and diffractive optical elements. The internationally renowned authors present different methods of lithographic and nonlithographic fabrication of microoptics and introduce the characterization and testing of microoptics. The second part of the book is dedicated to optical microsystems and MEMS, optical waveguide structures and optical nanostructures, including photonic crystals and metamaterials. Each chapter includes exercises illustrating a sample approach to new and complex topics, making the textbook suitable for lectures on optics as part of a physics or electrical engineering course.

Nanophotonics has emerged as a major technology and applications domain, exploiting the interaction of light-emitting and light-sensing nanostructured materials. These devices are light-weight, highly efficient, low on power consumption, and are cost effective to produce. The authors of this book have been involved in pioneering work in manufacturing photonic devices from carbon nanotube (CNT) nanowires and provide a series of practical guidelines for their design and manufacture, using processes such as nano-robotic manipulation and assembly methods. They also introduce the design and operational principles of opto-elctrical sensing devices at the nano scale. Thermal annealing and packaging processes are also covered, as key elements in a scalable manufacturing process. Examples of applications of different nanowire based photonic devices are presented. These include applications in the fields of electronics (e.g. FET, CNT Schotty diode) and solar energy. The book provides graduate students, practitioners and professionals with the background knowledge and tools needed to research and concretely develop new devices in the area of nano photonics and the necessary nano-manipulation and nano-assembly technologies required to do so. Discusses opto-electronic nanomaterials, characterization and properties from an engineering perspective, enabling the commercialization of key emerging technologies Provides scalable techniques for nanowire structure growth, manipulation and assembly (i.e. synthesis) Explores key application areas such as sensing, electronics and solar energy.

Introduction to Micro- and Nanooptics provides the reader with an introduction into the technological development, the physical background and the most important areas of micro- and nanooptics. The opening chapters on the physics of light are complemented by chapters on refractive and diffractive optical elements. The authors present different methods of lithographic and nonlithographic fabrication of miccrooptics and introduce the reader to characterization and testing of microoptics. The second part of the book is dedicated to....

This contributed volume summarizes recent theoretical developments in plasmonics and its applications in physics, chemistry, materials science, engineering, and medicine. It focuses on recent advances in several major areas of plasmonics including plasmon-enhanced spectroscopies, light scattering, many-body effects, nonlinear optics, and ultrafast dynamics. The theoretical and computational methods used in these investigations include electromagnetic calculations, density functional theory calculations, and nonequilibrium electron dynamics calculations. The book presents a comprehensive overview of these methods as well as their applications to various current problems of interest.

Microoptics is an important enabling technology for many areas of application. In this updated second edition of their modern text

and reference book, Stefan Sinzinger and Jürgen Jahns expertly and comprehensively present the basics and applications in microoptics, while incorporating the most important developments in recent years. An absolute must for physicists and electrical engineers, from advanced students right up to designers working in the field.

From optical fundamentals to advanced applications, this comprehensive guide to micro-optics covers all the key areas for those who need an in-depth introduction to micro-optic devices, technologies, and applications. Topics covered range from basic optics, optical materials, refraction, and diffraction, to micro-mirrors, micro-lenses, diffractive optics, optoelectronics, and fabrication. Advanced topics, such as tunable and nano-optics, are also discussed. Real-world case studies and numerous worked examples are provided throughout, making complex concepts easier to follow, whilst an extensive bibliography provides a valuable resource for further study. With exercises provided at the end of each chapter to aid and test understanding, this is an ideal textbook for graduate and advanced undergraduate students taking courses in optics, photonics, micro-optics, microsystems, and MEMs. It is also a useful self-study guide for research engineers working on optics development.

Nano-Optics: Fundamentals, Experimental Methods, and Applications offers insights into the fundamentals and industrial applications of nanoscale light-emitting materials and their composites. This book serves as a reference, offering an overview of existing research, with a particular focus on industrial applications. Nano-optics is the branch of nanoscience and nanotechnology that deals with interaction of light with nanoscale objects. This book explores the materials, structure, manufacturing techniques, and industrial applications of nano-optics. The applications discussed include healthcare, communication, astronomy, and satellites. Explains the major manufacturing techniques for light-emitting nanoscale materials Discusses how nanoscale optical materials are being used in a range of industrial applications Assesses the challenges of using nano-optics in a mass-production context

This book describes the state of the art in the field of bioanalytical nano- and microsystems with optical functionality. In 12 chapters distinguished scientists and leaders in their respective fields show how various optical technologies have been miniaturized and integrated over the last few decades in order to be combined with nano- and microsystems for applications in the life sciences. The main detection and characterization technologies are introduced, and examples of the superiority of these integrated approaches compared to traditional ones are provided. Examples from e.g. the fields of optical waveguides, integrated interferometers, surface plasmon resonance or Raman spectroscopy are introduced and discussed, and it is shown how these approaches have led to novel functionalities and thereby novel applications.

Fully revised and in its second edition, this standard reference on nano-optics is ideal for graduate students and researchers alike. Edited and authored by leading experts from top institutions in Europe, the US and Asia, this comprehensive overview of micro- and nanophotonics covers the physical and chemical fundamentals, while clearly focusing on the technologies and applications in industrial R&D. As such, the book reports on the four main areas of telecommunications and display technologies; light conversion and energy generation; light-based fabrication of materials; and micro- and nanophotonic devices in metrology and control.

This textbook introduces the general points of view of research methodology in the scientific and engineering fields of studies and presents an overview of the technical and professional communication needed for article publication in journals. It comprises several practice exercises that will give beginners the confidence to move on the communicative activities. Every chapter provides problem sets that will help readers check their understanding of each concept. The book will also help readers formulate specific research topics, research questions, and hypotheses; conduct literature reviews relevant to the research topics; develop applicable research methodologies; and write and present their research outlining the key elements of the proposed projects. It is very useful for students and researchers opting for a course on research methodology and for seminars at undergraduate and graduate levels.

21 years ago it was a joint idea with Hans Rottenkolber to organize a workshop dedicated to the discussion of the latest results in the automatic processing of fringe patterns. This idea was promoted by the insight that automatic and high precision phase measurement techniques will play a key role in all future industrial and scientific applications of optical metrology. A couple of months later more than 50 specialists from East and West met in East Berlin, the capital of the former GDR, to spend 3 days with the discussion of new principles of fringe processing. In the stimulating atmoshere the idea was born to repeat the workshop and to organize the meeting in an olympic schedule. And thus meanwhile 20 years have been passed and we have today Fringe number six. However, such a workshop takes place in a dynamic environment. Therefore the main topics of the previous events were always adapted to the most interesting subjects of the new period. In 1993 the workshop took place in Bremen and was dedicated to new principles of optical shape measurement, setup calibration, phase unwrapping and nondestructive testing, while in 1997 new approaches in multi-sensor metrology, active measurement strategies and hybrid processing technologies played a central role. 2001, the first meeting in the 21st century, was focused to optical methods for micromeasurements, hybrid measurement technologies and new sensor solutions for industrial inspection.

In Optical Nano and Micro Actuator Technology, leading engineers, material scientists, chemists, physicists, laser scientists, and manufacturing specialists offer an in-depth, wide-ranging look at the fundamental and unique characteristics of light-driven optical actuators. They discuss how light can initiate physical movement and control a variety of mechanisms that perform mechanical work at the micro- and nanoscale. The book begins with the scientific background necessary for understanding light-driven systems, discussing the nature of light and the interaction between light and NEMS/MEMS devices. It then covers innovative optical actuator technologies that have been developed for many applications. The book examines photoresponsive materials that enable the design of optically driven structures and mechanisms and describes specific light-driven technologies that permit the manipulation of micro- and nanoscale objects. It also explores applications in optofluidics, bioMEMS and biophotonics, medical device design, and micromachine control. Inspiring the next generation of scientists and engineers to advance light-driven technologies, this book gives readers a solid grounding in this emerging interdisciplinary area. It thoroughly explains the scientific language and fundamental principles, provides a holistic view of optical nano and micro actuator systems, and illustrates current and potential applications of light-driven systems.

This tutorial book offers an in-depth overview of the fundamental principles of micro/nano technologies and devices related to sensing, actuation and diagnosis in fluidics and biosystems. Research in the MEMS/NEMS and lab-on-chip fields has seen rapid growth in both academic and industrial domains, as these biodevices and systems are increasingly replacing traditional large size diagnostic tools. This book is unique in describing not only the devices and technologies but also the basic principles of their operation. The comprehensive description of the fabrication, packaging and principles of micro/nano biosystems presented in this book offers guidance for researchers

designing and implementing these biosystems across diverse fields including medical, pharmaceutical and biological sciences. The book provides a detailed overview of the fundamental mechanical, optical, electrical and magnetic principles involved, together with the technologies required for the design, fabrication and characterization of micro/nano fluidic systems and bio-devices. Written by a collaborative team from France and Korea, the book is suitable for academics, researchers, advanced level students and industrial manufacturers.

The deep interconnection between micro/nanooptical components and related fabrication technologies—and the constant changes in this ever-evolving field—means that successful design depends on the engineer's ability to accommodate cutting-edge theoretical developments in fabrication techniques and experimental realization. Documenting the state of the art in fabrication processes, Microoptics and Nanooptics Fabrication provides an up-to-date synopsis of recent breakthroughs in micro- and nanooptics that improve key developmental processes. This text elucidates the precise and miniaturized scale of today's fabrication methods and their importance in creating new optical components to access the spectrum of physical optics. It details successful fabrication techniques and their direct effect on the intended performance of micro- and nanooptical components. The contributors explore the constraints related to material selection, component lateral extent, minimum feature size, and other issues that cause fabrication techniques to lag behind corresponding theory in the development process. Written with the professional optical engineer in mind, this book omits the already well-published broader processing fundamentals. Instead it focuses on key tricks of the trade helpful in reformulating processes to achieve necessary optical targets, improve process fidelity, and reduce production costs. The contributing authors represent the vanguard in micro-optical fabrication. The result of their combined efforts, this searing analysis of emerging fabrication technologies will continue to fuel the expansion of optics components, from the microwave to the infrared through the visible regime.

"Thin-film microoptics" stands for novel types of microoptical components and systems which combine the well-known features of miniaturized optical elements with the specific advantages of thin optical layers. This approach enables for innovative solutions in shaping light fields in spatial, temporal and spectral domain. Low-dispersion and small-angle systems for tailoring and diagnosing laser pulses under extreme conditions as well as VUV-capable microoptics can be realized. Continuous-relief microstructures of refractive, reflective and hybrid characteristics are obtained by vapor deposition technologies with shadow masks in rotating systems. The book gives a comprehensive overview on fundamental laws of microoptics, types of thin-film microoptical components, methods and constraints of their design, fabrication and characterization, structure transfer into substrates, optical functions and applications. Recent theoretical and experimental results of basic and applied research are addressed. Particular emphasis will be laid on the generation of localized, nondiffracting few-cycle wavepackets of extended depth of focus and high tolerance against distortions. It is shown that the spectral interference of ultrabroadband conical beams results in spatio-temporal structures of characteristic X-shape, so-called X-waves, which are interesting for robust optical communication. New prospects are opened by exploiting small conical angles from nanolayer microoptics and self-apodized truncation of Bessel beams leading to the formation of single-maximum nondiffracting beams or "needle beams". Thin-film microoptical beam shapers have an enormous potential for future applications like the two-dimensional ultrafast optical processing, multichannel laser-matter interaction, nonlinear spectroscopy or advanced measuring techniques. - Introduces a new and promising branch of microoptics - Gives a compact overview on the types, properties and applications of the most important microoptical components containing valuable data and facts - Helps to understand the basic optical laws - Reports on the historical development line of thin-film microoptics - Provides brand new results of research and development in the field of ultrashort-pulse laser beam shaping and diagnostics - Discusses the future trends and first

approaches of next generation microoptics - Contains a carefully assorted glossary of the most important technical terms

This book is an introduction to the fundamentals and processes for micro and nano molding for plastic components. In addition to the basics, the book covers applications details and examples. The book helps both students and professionals to understand and work with the growing tools of molding and uses for micro and nano-sized plastic parts. Provides a comprehensive presentation on fundamentals and practices of manufacturing for micro / nano sized plastics partsCovers a relatively new but fast-growing field that is impacting any industry using plastic parts in their products (electronics, tele.

A NATO Advanced Research Workshop (ARW) entitled “Advanced Materials and Technologies for Micro/Nano Devices, Sensors and Actuators” was held in St. Petersburg, Russia, from June 29 to July 2, 2009. The main goal of the Workshop was to examine (at a fundamental level) the very complex scientific issues that pertain to the use of micro- and nano-electromechanical systems (MEMS and NEMS), devices and technologies in next generation commercial and defen- related applications. Micro- and nano-electromechanical systems represent rather broad and diverse technological areas, such as optical systems (micromirrors, waveguides, optical sensors, integrated subsystems), life sciences and lab equipment (micropumps, membranes, lab-on-chip, membranes, microfluidics), sensors (bio-sensors, chemical sensors, gas-phase sensors, sensors integrated with electronics) and RF applications for signal transmission (variable capacitors, tunable filters and antennas, switches, resonators). From a scientific viewpoint, this is a very multi-disciplinary field, including micro- and nano-mechanics (such as stresses in structural materials), electronic effects (e. g. charge transfer), general electrostatics, materials science, surface chemistry, interface science, (nano)tribology, and optics. It is obvious that in order to overcome the problems surrounding next-generation MEMS/NEMS devices and applications it is necessary to tackle them from different angles: theoreticians need to speak with mechanical engineers, and device engineers and modelers to listen to surface physicists. It was therefore one of the main objectives of the workshop to bring together a multidisciplinary team of distinguished researchers.

This book is volume II of a series of books on silicon photonics. It gives a fascinating picture of the state-of-the-art in silicon photonics from a component perspective. It presents a perspective on what can be expected in the near future. It is formed from 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 micro- and nanophotonics and optoelectronics.

This volume presents a considerable number of interrelated contributions dealing with the new scientific ability to shape and control matter and electromagnetic fields on a sub-wavelength scale. The topics range from the fundamental ones, such as photonic metamateriials, plasmonics and sub-wavelength resolution to the more applicative, such as detection of single molecules, tomography on a micro-chip, fluorescence spectroscopy of biological systems, coherent control of biomolecules, biosensing of single proteins, terahertz spectroscopy of nanoparticles, rare earth ion-doped nanoparticles, random lasing, and nanocoax array architecture. The various subjects bridge over the disciplines of physics, biology and chemistry, making this volume of interest to people working in these fields. The emphasis is on the principles behind each technique and on examining the full potential of each technique. The contributions that appear in this volume were presented at a NATO Advanced Study Institute that was held in Erice, Italy, 3-18 July, 2011. The pedagogical aspect of the Institute is reflected in the topics presented in this volume.

An introduction to micro and nano replication processes and applications Micro/Nano Replication: Processes and Applications provides an

overview of the fundamentals, processes, and applications involved in micro and nano replication in the manufacturing of product parts. A major field of nanotechnology, the study of micro/nano replication is sure to become one of increasing importance as the construction of completely new devices based on innovative concepts and crafted at the molecular level increases. Designed to help the reader understand and learn to work with the growing number of tools for molding plastic components, the book covers the key topics related to replication, including patterning technology, the modification of mold surface properties, and much more. In addition, it addresses the strengths and weaknesses of different molding processes. With a strong focus not only on how micro/nano replication works, but also the broader implications for the industry, the book is packed with examples of real world applications. These are drawn from a variety of fields, including information storage devices, optoelectronic elements, optical communication, and biosensors, in order to provide a complete view of the importance of micro and nano processes. A valuable introduction to a new but fast-growing field, Micro/Nano Replication is an essential resource for anyone looking to get a head start on understanding this emerging discipline.

This book provides a comprehensive overview of nano-optics, including basic theory, experiment and applications, particularly in nanofabrication and optical characterization. The contributions clearly demonstrate how advances in nano-optics and photonics have stimulated progress in nanoscience and -fabrication, and vice versa. Their expert authors address topics such as three-dimensional optical lithography and microscopy beyond the Abbe diffraction limit, optical diagnostics and sensing, optical data- and telecommunications, energy-efficient lighting, and efficient solar energy conversion. Nano-optics emerges as a key enabling technology of the 21st century. This work will appeal to a wide readership, from physics through chemistry, to biology and engineering. The contributions that appear in this volume were presented at a NATO Advanced Study Institute held in Erice, 4-19 July, 2015.

This groundbreaking book focuses on near-field microscopy which has opened up optical processes at the nanoscale for direct inspection. Further, it explores the emerging area of nano-optics which promises to make possible optical microscopy with true nanometer resolution. This frontline resource helps you achieve high resolution optical imaging of biological species and functional materials. You also find guidance in the imaging of optical device operation and new nanophotonics functionalities.

Introduction to Micro- and NanoopticsJohn Wiley & Sons