Molded Optics Design And Manufacture Series In Optics

The continuous miniaturization of products and the growing complexity of their embedded multifunctionalities necessitates continuous research and development efforts regarding micro components and related micro manufacturing technologies. Highly miniaturized systems, manufactured using a wide variety of materials, have found application in key technological fields, such as healthcare devices, micro implants, mobility, communications, optics, and micro electromechanical systems. Innovations required for the high-precision manufacturing of micro components can specifically be achieved through optimizations using post-process (i.e., offline) and in-process (i.e., online) metrology of both process input and output parameters, as well as geometrical features of the produced micro parts. However, it is of critical importance to reduce the metrology and optimization efforts, since process and product quality control can represent a significant portion of the total production time in micro manufacturing. To solve this fundamental challenge, research efforts have been undertaken in order to define, investigate, implement, and validate the so-called “product/process manufacturing fingerprint” concept. The “product manufacturing fingerprint” concept refers to those unique dimensional outcomes (e.g., surface topography, form error, critical dimensions, etc.) on the produced component that, if kept under control and within specifications, ensure that the entire micro component complies to its specifications. The “process manufacturing fingerprint” is a specific process parameter or feature to be monitored and controlled, in order to maintain the manufacture of products within the specified tolerances. By integrating both product and process manufacturing

fingerprint concepts, the metrology and optimization efforts are highly reduced. Therefore, the quality of the micro products increases, with an obvious improvement in production yield. Accordingly, this Special Issue seeks to showcase research papers, short communications, and review articles that focus on novel methodological developments and applications in micro- and sub-micro-scale manufacturing, process monitoring and control, as well as micro and sub-micro product quality assurance. Focus will be on micro manufacturing process chains and their micro product/process fingerprint, towards full process optimization and zero-defect micro manufacturing.

The main focus of this dissertation is to seek scientific and fundamental knowledge of nonconventional optical components including its optical design, ultraprecision prototyping, precision molds making, transition into industrial production and efficient evaluation. A nonconventional component in this dissertation is loosely defined as an optical component either that is not symmetric around its optical axis or that is aspherical surface with three or higher order coefficient. Nonconventional optics have broadened the vision of optical designers and enhanced the design flexibility and thus are becoming increasingly important as a core next-generation optical component. These optical components have gradually been implemented to replace conventional spherical and aspherical counterparts in the fields of imaging (Plummer, 1982), illumination (Fournier & Rolland, 2008), aviation (Spano, 2008) , and energy (Zamora, et al., 2009) where freeform optics have demonstrated excellent optical performance and high degree of system integration. However, design, fabrication and metrology of nonconventional optics have not been developed at the same pace. Due to the complex nature of nonconventional optics manufacturing processes, the

production efficiency and finished quality of nonconventional optical components are difficult to be improved. To validate optical performance, in this dissertation ultraprecision diamond tooling is applied to prototype the optical design, which is capable of generating precision optical features both on polymer blank and metal mold without post grinding and polishing process. In addition, the prototyping process also paves the way to mold fabrication. To produce low cost high volume high quality nonconventional optical components, precision compression/microinjection molding has been combined with ultraprecision diamond machining and cleanroom manufacturing respectively for different size scale and application. Once the low cost molded nonconventional optical components and assembly are fabricated, their optical performance needs to be characterized to ensure quality in industrial production. The geometric feature and principle optical parameter, such as focal length, are two important aspects that influence the final optical performance considerably. In order to solve the major problems in manufacturing affordable high quality nonconventional optical components, this dissertation will include several key steps: 1) Investigate nonconventional optics design that could be functionally and economically applied in various optical components or systems to further improve their performance; 2) Validate and evaluate nonconventional optics design by ultraprecision prototyping; 3) Develop the precision molds manufacturing process and the corresponding molding process both for miniaturized lens profile and micro scale diffraction structure; 4) Investigate the products quality by crucial optical parameters measurement and surface profiling. Overall, this dissertation describes a comprehensive understanding of low cost high volume nonconventional optics manufacturing.

This book highlights the tools and processes used to produce high-quality glass molded optics using commercially available equipment. Combining scientific data with easy-to-understand explanations of specific molding issues and general industry information based on firsthand studies and experimentation, it provides useful formulas for readers involved in developing develop in-house molding capabilities, or those who supply molded glass optics. Many of the techniques described are based on insights gained from industry and research over the past 50 years, and can easily be applied by anyone familiar with glass molding or optics manufacturing. There is an abundance of information from around the globe, but knowledge comes from the application of information, and there is no knowledge without experience. This book provides readers with information, to allow them to gain knowledge and achieve success in their glass molding endeavors.

With the ongoing release of 3D movies and the emergence of 3D TVs, 3D imaging technologies have penetrated our daily lives. Yet choosing from the numerous 3D vision methods available can be frustrating for scientists and engineers, especially without a comprehensive resource to consult. Filling this gap, Handbook of 3D Machine Vision: Optical Metro

?All This Fun, and a Paycheck, too??

Towards Synthesis of Micro-/Nano-systems
Advanced Optics Using Aspherical Elements
OPTICAL SYSTEM DESIGN
Handbook of Optical Dimensional Metrology

While several available texts discuss molded plastic optics, none provide information on all classes of molded optics. Filling this gap, Molded Optics: Design and Manufacture presents detailed descriptions of molded plastic, glass, and infrared optics. Since an understanding of the manufacturing process is necessary to develop cost-effective, producible designs, the book extensively covers various manufacturing methods, design guidelines, trade-offs, best practices, and testing of critical parameters. It also discusses topics that often arise when designing systems with molded optics, such as mitigating stray light and mating systems by eye. The first three chapters of the book focus on subjects important to the design of systems using molded optics: optical design, visual optics, and stray light. Following these background chapters, the text provides in-depth information on the design and manufacture of molded plastic optics, molded glass optics, and molded infrared optics. The final chapter on testing emphasizes the special characteristics of molded optics. Experts in their particular areas, the authors draw on their considerable knowledge and real-world experiences to give a thorough account of the design and manufacture of molded plastic, glass, and infrared optics. The book will help readers improve their ability to develop systems that employ molded optics.

This new edition features numerous updates and additions. Especially 4 new chapters on Fiber Optics, Integrated Optics, Frequency Combs and Interferometry reflect the changes since the first edition. In addition, major complete updates for the chapters: Optical Materials and Their Properties, Optical Detectors, Nanooptics, and Optics far Beyond the Diffraction Limit. Features Contains over 1000 two-color illustrations. Includes over 120 comprehensive tables with properties of optical materials and light sources. Emphasizes physical concepts over extensive mathematical derivations. Chapters with summaries, detailed index Delivers a wealth of up-to-date references.

Foreword by Nobel laureate Professor Theodor W. Hänsch of Ludwig-Maximilians-Universität

München Based on the authors' experimental work over the last 25 years, Laser-Based Measurements for Time and Frequency Domain Applications: A Handbook presents basic concepts, state-of-the-art applications, and future trends in optical, atomic, and molecular physics. It provides all the background information on the main kinds of laser sources and techniques, offers a detailed account of the most recent results obtained for time- and frequency-domain applications of lasers, and develops the theoretical framework necessary for understanding the experimental applications. After a historical introduction, the book describes the basic concepts and mathematical tools required for studying the physics of oscillators. It then discusses microwave and optical resonators, crucial aspects of operation and fundamental properties of lasers, and precision spectroscopy and absolute frequency metrology. It also focuses on microwave and optical frequency standards and explores current and potential research directions. Accessible to scientists, postdoc researchers, and advanced undergraduate students, this self-contained book gives a wide-ranging, balanced overview of the areas—including frequency standards and clocks, ultra-high-precision spectroscopy, quantum information, and environmental metrology—revolutionized by the recent advent of optical frequency comb synthesizers (OFCSs) based on femtosecond mode-locked lasers. The book is also a useful guide to cutting-edge research for manufacturers of advanced laser systems and optical devices.

Despite a number of books on biophotonics imaging for medical diagnostics and therapy, the field still lacks a comprehensive imaging book that describes state-of-the-art biophotonics imaging approaches intensively developed in recent years. Addressing this shortfall, Advanced Biophotonics: Tissue Optical Sectioning presents contemporary methods and applications of biophotonics imaging. Gathering research otherwise scattered in numerous physical, chemical, biophysical, and biomedical journals, the book helps researchers, bioengineers, and medical doctors understand major recent bioimaging

technologies and the underlying biophotonics science. Well-known international experts explore a variety of "hot" biomedical optics and biophotonics problems, including the use of photoacoustic imaging to investigate the molecular and cellular processes in living systems. The book also covers Monte Carlo modeling, tissue optics and tissue optical clearing, nonlinear optical microscopy, various aspects of optical coherence tomography, multimodal tomography, adaptive optics, and signal imaging. With 58 color images, this book represents a valuable contribution to the biomedical and biophotonics literature. Designed for researchers and practitioners in biophotonics, the book is also a useful resource for scientists in laser physics and technology, fiber optics, spectroscopy, materials science, biology, and medicine as well as students studying biomedical physics and engineering, biomedical optics, and biophotonics.

Tissue Optical Sectioning

The Failure Mechanisms of Coated Precision Glass Molding Tools

Encyclopedia of Optical Engineering: Las-Pho, pages 1025-2048

Optical Metrology and Imaging

Handbook of Silicon Photonics

The 11th International Conference on Precision Engineering (ICPE) August 16-18, 2006, Tokyo, Japan

This collection represents successful invited submissions from the papers presented at the 8th Annual Conference of Energy Economics and Management held in Beijing, China, 22-24 September 2017. With over 500 participants, the conference was co-hosted

by the Management Science Department of National Natural Science Foundation of China, the Chinese Society of Energy Economics and Management, and Renmin University of China on the subject area of “Energy Transition of China: Opportunities and Challenges”. The major strategies to transform the energy system of China to a sustainable model include energy/economic structure adjustment, resource conservation, and technology innovation. Accordingly, the conference and its associated publications encourage research to address the major issues faced in supporting the energy transition of China. Papers published in this collection cover the broad spectrum of energy economics issues, including building energy efficiency, industrial energy demand, public policies to promote new energy technologies, power system control technology, emission reduction policies in energy-intensive industries, emission measurements of cities, energy price movement, and the impact of new energy vehicle. Nitride Phosphors and Solid-State Lighting provides an in-depth introduction to the crystal chemistry, synthesis, luminescence, and applications of phosphor materials for solid-state lighting, mainly focusing on new nitride phosphors. Drawing on their

extensive experimental work, the authors offer a multidisciplinary study of phosphor materials that encompasses materials science, inorganic chemistry, solid-state chemistry, solid-state physics, optical spectroscopy, crystal field theory, and computational materials science. The book begins with an introduction to the principles, semiconductor/phosphor materials, and characterizations of solid-state lighting and white light-emitting diodes (LEDs). It then discusses the optical and luminescence processes occurring in optically active centers of solid materials and presents the photoluminescence properties of traditional phosphors for white LEDs, including garnets, aluminates, silicates, sulfides, oxysulfides, phosphates, and scheelites. The remainder of the text focuses on newly developed nitride phosphors. The authors describe the crystal chemistry of general nitride compounds, the crystal structure and photoluminescence properties of new nitride phosphors, and synthetic methods for preparing nitride phosphors. They detail the structural analysis of nitride phosphors and present experimental and computational results of typical nitride phosphors. The authors also examine key issues,

such as excitation and emission spectra, thermal quenching, and quantum efficiency. The final chapter explores applications of nitride phosphors in white LEDs for general lighting and LCD backlight purposes. Covering novel luminescent materials, this book brings you up to date on the evolving field of solid-state lighting. It illustrates the fundamentals, synthesis, properties, and applications of the latest nitride phosphor materials.

Biomimetic photonics is a burgeoning field. Biologists are finding and describing a whole menagerie of unique and astonishingly complex nano- and microstructures in fauna and flora. Material scientists are developing novel multifunctional and hierarchical structures with a wide variety of post-nano era photonics applications. Mathematicians and computer scientists are using computer models and simulations to understand the underlying principles of biomimetic structures. However, concepts, structures, and phenomena that are well known in one community are quite unknown in others. Exploring a biomimetic approach to developing photonic devices and structures, Biomimetics in Photonics discusses not only the role of and

results of biomimicry in engineering, but also the true understanding of natural processes and the application of these techniques to established technologies. Featured Topics Photonic structures in flowers, leaves and fruits and inorganic structures produced in aquatic environment by diatoms, sponges, and shells Mechanisms for biomineralization and how natural structures can be synthetically modified or even used as templates for artificial photonic materials Biological photonic structures in beetles and butterflies and their bio-inspired applications, including anti-reflecting surfaces, iridescent viruses, light reflection, metallic effects, and infrared sensors Suitable for researchers and graduate students, the book does more than describe how to extract good design from nature—Biomimetics in Photonics highlights natural design techniques in context, allowing for a more complete modeling picture. It demonstrates the possibilities and challenges in the move from a laboratory environment to industrial scale production of biomimetic photonic structures.

Provides an in-depth understanding of the fundamentals of a wide range of state-of-the-art materials manufacturing processes

Modern manufacturing is at the core of industrial production from base materials to semi-finished goods and final products. Over the last decade, a variety of innovative methods have been developed that allow for manufacturing processes that are more versatile, less energy-consuming, and more environmentally friendly. This book provides readers with everything they need to know about the many manufacturing processes of today. Presented in three parts, Modern Manufacturing Processes starts by covering advanced manufacturing forming processes such as sheet forming, powder forming, and injection molding. The second part deals with thermal and energy-assisted manufacturing processes, including warm and hot hydrostamping. It also covers high speed forming (electromagnetic, electrohydraulic, and explosive forming). The third part reviews advanced material removal process like advanced grinding, electro-discharge machining, micro milling, and laser machining. It also looks at high speed and hard machining and examines advances in material modeling for manufacturing analysis and simulation. Offers a comprehensive overview of advanced materials manufacturing processes Provides practice-oriented information to help readers

find the right manufacturing methods for the intended applications Highly relevant for material scientists and engineers in industry Modern Manufacturing Processes is an ideal book for practitioners and researchers in materials and mechanical engineering.

Integrative Production Technology

Biomimetics in Photonics

Computer-Aided Manufacturing and Design

Molded Optics

From Mold Design to Product

Nitride Phosphors and Solid-State Lighting

MV engineering is a truly multidisciplinary area and perhaps because of this, it is plagued with imprecise jargon. This book attempts to collect the fundamental concepts into a single, well-integrated, self-consistent exposition that will serve as a relatively painless introduction to the field of MV Engineering. The ultimate goal is an enlightened practitioner capable of using this powerful new technology effectively.

Modern optical systems rely on leading-edge production technologies, especially when using aspherical optical elements. Due to the inherent complexity of aspheres, all efforts to push the technological limits are risky. Thus, to minimize risk, clear decisions based on a good understanding of technology are indispensable. This compendium is written as an

optical technology reference book for development and production engineers. With contributions from worldwide experts, this book aids in mitigating the risk in adopting new asphere production technologies.

This comprehensive handbook covers all major aspects of optomechanical engineering - from conceptual design to fabrication and integration of complex optical systems. The practical information within is ideal for optical and optomechanical engineers and scientists involved in the design, development and integration of modern optical systems for commercial, space, and military applications. Charts, tables, figures, and photos augment this already impressive text. Fully revised, the new edition includes 4 new chapters: Plastic optics, Optomechanical tolerancing and error budgets, Analysis and design of flexures, and Optomechanical constraint equations.

This unique book provides the optics designer and user with the latest advances on materials used as optical elements in systems and devices—in one convenient volume. Presenting fundamental performance requirements, basic characteristics, principles of fabrication, possibilities for new or modified optical materials, and key characterization data, this outstanding source facilitates optical materials selection and application. Comprehensive and thorough, this reference offers a broad review of old and new optical materials such as glasses, crystalline materials, plastics, and coatings... contains specific optical and characterization information useful for preliminary calculations ... and explains processes used to manufacture optical materials, giving insight into possible modifications

of materials caused by process variations. Plus, this practical text includes a glossary of terms for a basic understanding, numerous illustrations for a clear perspective, and references for easy access to related material. This single-source volume is ideal for optical system/device designers and developers; design and development engineers; materials engineers; physical measurements engineers; test engineers, optics designers, and optics engineers; professional seminars; and undergraduate- and graduate-level students in optical and materials sciences courses.

Image Acquisition

Opto-Mechanical Systems Design, Third Edition

Modern Manufacturing Processes

An Introduction to Selection and Application

Current Developments in Optical Design and Optical Engineering

Modern Ophthalmic Optics

This basic source for identification of U.S. manufacturers is arranged by product in a large multi-volume set. Includes: Products & services, Company profiles and Catalog file.

This classic resource provides a clear, well-illustrated introduction to the essentials of optical design-from basic principles to cutting-edge design methods.

After nearly two decades, Paul Yoder's Opto-Mechanical Systems

Design continues to be the reference of choice for professionals fusing optical and mechanical components into advanced, high-performance instruments. Yoder's authoritative systems-oriented coverage and down-to-earth approach fosters the deep-seated knowledge needed to continually push the field to new limits. Extensively revised and updated, this Third Edition reflects the massive growth and advancement achieved in the field over the past few years. It systematically examines the building blocks for new optical instruments and details new tools and techniques for designing, building, and testing optical systems hardware. The book includes revised, broad-based standards, equations for designing 26 types of prisms and lens, mirror, and prism mounts, state-of-the-art examples of designs for large mirrors and their mounts, and an expanded chapter that consolidates information on the design and mounting of metal mirrors. New sections include special protective coatings, manufacturing techniques, mounting lenses on flexures, and techniques for aligning lenses and lens systems in addition to two new chapters: one on designing and mounting small mirrors, gratings, and pellicles; the other, on analysis methods including damage and failure

analysis. Whether you are designing a high-resolution projector or the most sensitive space telescope, Opto-Mechanical Systems Design, Third Edition supplies the tools you need in a single, concise reference.
Vols. for 1970-71 includes manufacturers' catalogs.
Design and Manufacture
Theory and Applications
Precision Dimensional Measurements
Thomas Register of American Manufacturers and Thomas Register Catalog File
Design, Fabrication and Evaluation of Nonconventional Optical Components
Design, Fabrication and Metrology of Precision Molded Freeform Plastic Optics

Recent advancements in computer technology have allowed for designers to have direct control over the production process through the help of computer-based tools, creating the possibility of a completely integrated design and manufacturing process. Over the last few decades, "artificial intelligence" (AI) techniques, such as machine learing and deep learning, have

been topics of interest in computer-based design and manufacturing research fields. However, efforts to develop computer-based AI to handle big data in design and manufacturing have not yet been successful. This Special Issue aims to collect novel articles covering artificial intelligence-based design, manufacturing, and data-driven design. It will comprise academics, researchers, mechanical, manufacturing, production and industrial engineers and professionals related to engineering design and manufacturing.

This contributed volume contains the research results of the Cluster of Excellence "Integrative Production Technology for High-Wage Countries", funded by the German Research Society (DFG). The approach to the topic is genuinely interdisciplinary, covering insights from fields such as engineering, material sciences, economics and social sciences. The book contains coherent deterministic models for integrative product creation chains as well as harmonized cybernetic models of production systems. The content is structured into five sections: Integrative Production Technology, Individualized Production, Virtual Production Systems, Integrated Technologies, Self-

Optimizing Production Systems and Collaboration Productivity.The target audience primarily comprises research experts and practitioners in the field of production engineering, but the book may also be beneficial for graduate students.

The main focus of this dissertation is to seek scientific knowledge and fundamental understanding of molding process for freeform optical lens fabrication by integrating freeform optical design, precision freeform molding making, numerical modeling of polymer lens forming process, and evaluation of the molded freeform optics. Compared with conventional optics, freeform optics provides more flexibilities and better performance. However, due to the complex nature of freeform optics manufacturing processes, the productivity and quality is difficult to improve, which subsequently results in higher manufacturing cost. Therefore, in order to create affordable freeform lenses with high quality, the method combining ultraprecision diamond machining and optical molding is proposed. Ultraprecision diamond machining is a process that allows us to generate precision freeform optical features on mold surfaces without post polishing, while

microinjection/compression molding is proven high volume manufacturing process used to reduce production cost. The diamond machining for both regular metal materials and brittle materials are discussed to obtain high quality molds with optical finish. In addition, two novel process designs are presented to fabricate hybrid glass-polymer achromatic lenses using compression molding and injection molding, respectively.
This collection of papers, presented at the 11th International Conference on Precision Engineering, offers a broader global perspective on the challenges and opportunities ahead. The discussion encompasses leading-edge technologies and forecasts future trends. Coverage includes advanced manufacturing systems; ultra-precision- and micro-machining; nanotechnology for fabrication and measurement; rapid prototyping and production technology; new materials and advanced processes; computer-aided production engineering; manufacturing process control; production planning and scheduling, and much more.
Advanced Biophotonics
Handbook of machine vision engineering: Volume 1
Optical Materials

Precision Lens Molding of Glass: A Process Perspective

Lens Design Fundamentals

Springer Handbook of Lasers and Optics

Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses and mirror systems – give insight for both the newcomer and specialist in the field Rudolf Kingslake is regarded as the American father of lens design; his book, not revised since its publication in 1978, is viewed as a classic in the field. Naturally, the area has developed considerably since the book was published, the most obvious changes being the availability of powerful lens design software packages, theoretical advances, and new surface fabrication technologies. This book provides the skills and knowledge to move into the exciting world of contemporary lens design and develop practical lenses needed for the great variety of 21st-century applications. Continuing to focus on fundamental methods and procedures of lens design, this revision by R. Barry Johnson of a classic modernizes symbology and nomenclature, improves conceptual clarity, broadens the study of aberrations, enhances discussion of multi-mirror systems, adds tilted and decentered systems with eccentric pupils, explores use of aberrations in the optimization process, enlarges field flattener concepts, expands discussion of image analysis, includes many new exemplary examples to illustrate concepts, and much more. Optical engineers working in lens design will find this book an invaluable guide to lens design in traditional and emerging areas of application; it is also suited to advanced undergraduate or graduate course in lens design

principles and as a self-learning tutorial and reference for the practitioner. Rudolf Kingslake (1903-2003) was a founding faculty member of the Institute of Optics at The University of Rochester (1929) and remained teaching until 1983. Concurrently, in 1937 he became head of the lens design department at Eastman Kodak until his retirement in 1969. Dr. Kingslake published numerous papers, books, and was awarded many patents. He was a Fellow of SPIE and OSA, and an OSA President (1947-48). He was awarded the Progress Medal from SMPTE (1978), the Frederic Ives Medal (1973), and the Gold Medal of SPIE (1980). R. Barry Johnson has been involved for over 40 years in lens design, optical systems design, and electro-optical systems engineering. He has been a faculty member at three academic institutions engaged in optics education and research, co-founder of the Center for Applied Optics at the University of Alabama in Huntsville, employed by a number of companies, and provided consulting services. Dr. Johnson is an SPIE Fellow and Life Member, OSA Fellow, and an SPIE President (1987). He published numerous papers and has been awarded many patents. Dr. Johnson was founder and Chairman of the SPIE Lens Design Working Group (1988-2002), is an active Program Committee member of the International Optical Design Conference, and perennial co-chair of the annual SPIE Current Developments in Lens Design and Optical Engineering Conference. Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses and mirror systems – give insight for both the newcomer and specialist in the field

The book is a collection of stories: assignments from a long and enjoyable engineering career

as well as anecdotes and experiences from summer jobs, vacations, and consulting. The focus is technical; each little story pivots on some scientific principle. The intent is three-fold: a) genealogical: to capture descriptions of a lifetime of fun times and accomplishments for descendents who might be curious about old great-grandpa Tom; b) to inspire a next generation of youngsters to consider pursuit of engineering, science, and critical thought, as a door to a fruitful life; and c) to try to bridge that pervasive "boring and/or over-my-head" gap by showing that "engineering" concepts are essentially common-sense and intuitive (you learned them in kindergarten playground), and the jargon should not be off-putting. The book's message: Engineering/science can be fun; it happens every day and everywhere; a degree is not a prerequisite.

A coherent overview of the current status of injection molded optics, describing in detail all aspects of plastic optics, from design issues to production technology and quality control. This updated second edition is supplemented by a chapter on the equipment and process of injection wells as well as a look at recent applications. The contributors, each one a leading expert in their discipline, have either a background in or strong ties to the industry, thus combining a large amount of practical experience. With its focus firmly set on practical applications, this is an indispensable reference for all those working in optics research and development.

"Molding processes continue to innovate and push the boundaries of optical systems, not only for state-of-the-art, high-volume consumer products but also touching on almost every application where optics are used, from automotive headlights and medical endoscopes to thermal weapon sights for the warfighter. The most common optical molding technologies are

injection molding of optical plastics and precision glass molding. This Field Guide primarily focuses on these two technologies but also covers the full spectrum of optical molding. It provides a convenient and concise source of knowledge on optical molding technologies and will be a valuable addition to a publication base that is rather limited"--

Handbook of 3D Machine Vision

A Handbook

Properties, Fabrication and Liquid Lenses

Glassy Materials Based Microdevices

Fabrication of Complex Optical Components

Design and Fabrication of Nonconventional Optical Components by Precision Glass Molding

Provides a comprehensive account of the most recent developments in modern ophthalmic optics, including free form technology.

Compiled by 330 of the most widely respected names in the electro-optical sciences, the Encyclopedia is destined to serve as the premiere guide in the field with nearly 2000 figures, 560 photographs, 260 tables, and 3800 equations. From astronomy to x-ray optics, this reference contains more than 230 vivid entries examining the most intriguing technological advances and perspectives from distinguished professionals around the globe. The contributors have selected topics of utmost importance in areas including digital image enhancement, biological modeling, biomedical spectroscopy,

and ocean optics, providing thorough coverage of recent applications in this continually expanding field.

Molded OpticsDesign and ManufactureCRC Press

Due to the development of microscale fabrication methods, microlenses are being used more and more in many unique applications, such as artificial implementations of compound eyes, optical communications, and labs-on-chips. Liquid microlenses, in particular, represent an important and growing research area yet there are no books devoted to this topic that summarize the research to date. Rectifying this deficiency, Microlenses: Properties, Fabrication and Liquid Lenses examines the recent progress in the emerging field of liquid-based microlenses. After describing how certain problems in optics can be solved by liquid microlenses, the book introduces the physics and fabrication methods involved in microlenses. It also details the facility and equipment requirements for general fabrication methods. The authors then present examples of various microlenses with non-tunable and tunable focal lengths based on different mechanisms, including: Non-tunable microlenses: Ge/SiO2 core/shell nanolenses, glass lenses made by isotropic etching, self-assembled lenses and lens arrays, lenses fabricated by direct photo-induced polymerization, lenses formed by thermally reflowing photoresist, lenses

formed from inkjet printing, arrays fabricated through molding processes, and injection-molded plastic lenses Electrically tuned microlenses: liquid crystal-based lenses and liquid lenses driven by electrostatic forces, dielectrophoretic forces, electrowetting, and electrochemical reactions Mechanically tunable microlenses: thin-membrane lenses with varying apertures, pressures, and surface shapes; swellable hydrogel lenses; liquid–liquid interface lenses actuated by environmentally stimuli-responsive hydrogels; and oscillating lens arrays driven by sound waves Horizontal microlenses: two-dimensional polymer lenses, tunable and movable liquid droplets as lenses, hydrodynamically tuned cylindrical lenses, liquid core and liquid cladding lenses, air–liquid interface lenses, and tunable liquid gradient refractive index lenses The book concludes by summarizing the importance of microlenses, shedding light on future microlens work, and exploring related challenges, such as the packaging of systems, effects of gravity, evaporation of liquids, aberrations, and integration with other optical components.

Product/Process Fingerprint in Micro Manufacturing

Handbook of Optomechanical Engineering

Thomas Register of American Manufacturers

Laser-Based Measurements for Time and Frequency Domain Applications

Handbook of Plastic Optics
Field Guide to Molded Optics

Microtechnology has changed our world since the last century, when silicon microelectronics revolutionized sensor, control and communication areas, with applications extending from domotics to automotive, and from security to biomedicine. The present century, however, is also seeing an accelerating pace of innovation in glassy materials; as an example, glass-ceramics, which successfully combine the properties of an amorphous matrix with those of micro- or nano-crystals, offer a very high flexibility of design to chemists, physicists and engineers, who can conceive and implement advanced microdevices. In a very similar way, the synthesis of glassy polymers in a very wide range of chemical structures offers unprecedented potential of applications. The contemporary availability of microfabrication technologies, such as direct laser writing or 3D printing, which add to the most common processes (deposition, lithography and etching), facilitates the development of novel or advanced microdevices based on glassy materials. Biochemical and biomedical sensors, especially with the lab-on-a-chip target, are one of the most evident proofs of the success of this material platform. Other applications have also emerged in environment, food, and chemical industries. The present Special Issue of Micromachines aims at reviewing the current state-of-the-art and presenting perspectives of further development. Contributions related to the technologies, glassy materials,

design and fabrication processes, characterization, and, eventually, applications are welcome.

Molding tools in precision glass molding fail easily, even with protective thin film coatings applied. In this work, various efficient methods for assessing glass-coating interactions are developed, including a new, automated testing rig. Analysis of the testing results provides a better understanding of these mechanisms and how they are influenced by material properties and process parameters, so that the appropriate measures can be taken to prolong the life of the molding tools.

High quality optical components for consumer products made of glass and plastic are mostly fabricated by replication. This highly developed production technology requires several consecutive, well-matched processing steps called a "process chain" covering all steps from mold design, advanced machining and coating of molds, up to the actual replication and final precision measurement of the quality of the optical components. Current market demands for leading edge optical applications require high precision and cost effective parts in large volumes. For meeting these demands it is necessary to develop high quality process chains and moreover, to crosslink all demands and interdependencies within these process chains. The Transregional Collaborative Research Center "Process chains for the replication of complex optical elements" at Bremen, Aachen and Stillwater worked extensively and thoroughly in this field from 2001

to 2012. This volume will present the latest scientific results for the complete process chain giving a profound insight into present-day high-tech production.

Due to their speed, data density, and versatility, optical metrology tools play important roles in today's high-speed industrial manufacturing applications. Handbook of Optical Dimensional Metrology provides useful background information and practical examples to help readers understand and effectively use state-of-the-art optical metrology methods. The book first builds a foundation for evaluating optical measurement methods. It explores the many terms of optical metrology and compares it to other forms of metrology, such as mechanical gaging, highlighting the limitations and errors associated with each mode of measurement at a general level. This comparison is particularly helpful to current industry users who operate the most widely applied mechanical tools. The book then focuses on each application area of measurement, working down from large area to medium-sized to submicron measurements. It describes the measurement of large objects on the scale of buildings, the measurement of durable manufactured goods such as aircraft engines and appliances, and the measurement of fine features on the micron and nanometer scales. In each area, the book covers fast, coarse measures as well as the finest measurements possible. Best practices and practical examples for each technology aid readers in effectively using the methods. Requiring no prior expertise in optical dimensional metrology, this handbook helps engineers and quality specialists

understand the capabilities and limitations of optical metrology methods. It also shows them how to successfully apply optical metrology to a vast array of current engineering and scientific problems.

Mantech Journal

Microlenses

Plastics Institute of America Plastics Engineering, Manufacturing & Data Handbook

Precision glass molding is a net-shaping process to fabricate glass optics by replicating optical features from precision molds to glass at elevated temperature. The advantages of precision glass molding over traditional glass lens fabrication methods make it especially suitable for the production of optical components with complicated geometries, such as aspherical lenses, diffractive hybrid lenses, microlens arrays, etc. Despite of these advantages, a number of problems must be solved before this process can be used in industrial applications. The primary goal of this research is to determine the feasibility and performance of nonconventional optical components formed by precision glass molding. This research aimed to investigate glass molding by combing experiments and finite element method (FEM) based numerical simulations. The first step was to develop an integrated compensation solution for both surface deviation and refractive index drop of glass optics. An FEM simulation based on

Tool-Narayanaswamy-Moynihan (TNM) model was applied to predict index drop of the molded optical glass. The predicted index value was then used to compensate for the optical design of the lens. Using commercially available general purpose software, ABAQUS, the entire process of glass molding was simulated to calculate the surface deviation from the adjusted lens geometry, which was applied to final mold shape modification. A case study on molding of an aspherical lens was conducted, demonstrating reductions in both geometry and wavefront error by more than 60%.

The development of integrated silicon photonic circuits has recently been driven by the Internet and the push for high bandwidth as well as the need to reduce power dissipation induced by high data-rate signal transmission. To reach these goals, efficient passive and active silicon photonic devices, including waveguide, modulators, photodetectors,

This book provides a simplified, practical, and innovative approach to understanding the design and manufacture of plastic products in the World of Plastics. The concise and comprehensive information defines and focuses on past, current, and future technical trends. The handbook reviews over 20,000 different subjects; and contains over 1,000 figures and more than 400 tables. Various plastic materials and their behavior patterns are reviewed. Examples are

provided of different plastic products and relating to them critical factors that range from meeting performance requirements in different environments to reducing costs and targeting for zero defects. This book provides the reader with useful pertinent information readily available as summarized in the Table of Contents, List of References and the Index.