The Physics Of Microdroplets Hardcover 2012 By Jean Berthier

The Airborne MicroparticleNanomaterials for 2D and 3D PrintingNatural Fibers, Plastics and CompositesMicrofluidics and NanofluidicsMicrodroplet TechnologyOpen MicrofluidicsExtraction of Natural Products Using Near-Critical SolventsLabel-Free Super-Resolution MicroscopyNucleic Acid Amplification Strategies for Biosensing, Bioimaging and BiomedicineDifferential Ion Mobility SpectrometryLight-Active Functional Organic MaterialsOrganic LasersOceanography Challenges to Future EarthOptical Processes in MicrocavitiesMicrofluidicsGreen Chemistry and Sustainable TechnologyThe Physics of MicrodropletsOptical MicrocavitiesProtein Engineering HandbookFood Process Engineering and Quality AssuranceThe Finite Volume Method in Computational Fluid DynamicsNanostructured CatalystsApplications of Microfluidic Systems in Biology and MedicineBiosensorsPrinciples and Techniques of Biochemistry and Molecular BiologyOptical Processes in Microparticles and NanostructuresNatural Gas Engineering and Safety ChallengesMicrofluidicsCardiovascular Solid MechanicsFunctional Gradient Materials and Surface Layers Prepared by Fine Particles TechnologyMicrofluidic DiagnosticsCatalyst PreparationMicro-Drops and Digital MicrofluidicsLiquid Crystal ColloidsZintl PhasesSingle-Molecule Optical Detection, Imaging and SpectroscopyThe BAM ComplexNano-Optics: Principles Enabling Basic Research and ApplicationsBiomaterials Fabrication and Processing HandbookMicrofluidics for Biotechnology

The Airborne Microparticle

Nanotechnology is a budding field and has a pivotal role in sensing. Nanomaterials exist in various forms such as nanoparticles, nanoclusters, nanobelts, and nanospheres. These nanomaterials act as sensing interfaces and immobilization surfaces for various biomolecules such as enzymes, DNA, and antigens. Therefore, the preparation and characterization of these nanoparticles play an important role in sensing devices. This handbook has evolved from the authors’ teaching and research experience in the field of nanoparticle biosensing. It encompasses protocols for the synthesis of various forms of metal oxide nanoparticles; study of the various characterizing techniques that help deduce the shape, size, and morphology of these nanoparticles; and applications of these nanoparticles in the field of biosensors. It presents voltammetry techniques such as cyclic, linear wave, wave pulse, and differential pulse voltammetry, throws light on the interactions of nanomaterials and biomolecules, and discusses microfluidic devices, which due to their unique capability of miniaturization fascinate many researchers. It is a practical and user-friendly textbook that introduces the various basic principles and practical information that will help undergraduate and advanced-level students and researchers understand the science behind nanoscale sensing.

Nanomaterials for 2D and 3D Printing

Improving the effectiveness of catalysts is the best way to ensure cleaner, more efficient industrial processes for a wide range of applications. Catalyst Preparation: Science and Engineering explores the optimization of catalytic materials through traditional and novel methods of catalyst preparation, characterization, and monitoring on laboratory and industrial scales. The book presents many key principles of heterogeneous catalyst preparation and the methods used to synthesize a catalyst with a particular composition and morphology. The first chapters examine the synthesis of bulk materials including amorphous and mesoporous oxide supports, heteropolyacids, and colloidal metals. Subsequent chapters focus on the syntheses of heterogeneous nanoscale materials, including those based on metal complex–substrate interactions and those using non-interacting precursors via viscous drying. The final chapters concentrate on pretreatment, drying, and finishing effects before concluding with a prognosis on future applications involving catalyst preparation and the technological advances necessary for continued progress. An ideal companion for scientists exploring the preparation of application-specific catalysts based on desired catalytic properties, Catalyst Preparation: Science and Engineering provides a balanced overview of important synthesis parameters to consider for good catalyst design.

Natural Fibers, Plastics and Composites

The first book offering a global overview of fundamental microfluidics and the wide range of possible applications, for example, in chemistry, biology, and biomedical science. As such, it summarizes recent progress in microfluidics, including its origin and development, the theoretical fundamentals, and fabrication techniques for microfluidic devices. The book also comprehensively covers the fluid mechanics, physics and chemistry as well as applications in such different fields as detection and synthesis of inorganic and organic materials. A useful reference for non-specialists and a basic guideline for research scientists and technicians already active in this field or intending to work in microfluidics.

Microfluidics and Nanofluidics

Flow Control Methods and Devices in Micrometer Scale Channels, by Shuichi Shoji and Kentaro Kawai. Micromixing Within Microfluidic Devices, by Lorenzo Capretto, Wei Cheng, Martyn Hill and Xunli Zhang. Basic Technologies for Droplet Microfluidics, by Shaojiang Zeng, Xin Liu, Hua Xie and Bingcheng Lin. Electrorheological Fluid and Its Applications in Microfluidics, by Limu Wang, Xiuqing Gong and Weijia Wen. Biosensors in Microfluidic Chips, by Jongmin Noh, Hee Chan Kim and Taek Dong Chung. A Nanomembrane-Based Nucleic Acid Sensing Platform for Portable Diagnostics, by Satyajyoti Senapati, Sagnik Basuray, Zdenek Slouka, Li-Jing Cheng and Hsueh-Chia Chang. Optical Detection Systems on Microfluidic Chips, by Hongwei Gai, Yongjun Li and Edward S. Yeung. Integrated Microfluidic Systems for DNA Analysis, by Samuel K. Njoroge, Hui-Wen Chen, Magorzata A. Witek and Steven A. Soper. Integrated Multifunctional Microfluidics for Automated Proteome Analyses, by John K. Osiri, Hamed Shadpour, Magorzata A. Witek and Steven A. Soper. Cells in Microfluidics, by

Chi Zhang and Danny van Noort. Microfluidic Platform for the Study of Caenorhabditis elegans,by Weiwei Shi, Hui Wen, Bingcheng Lin and Jianhua Qin.

Microdroplet Technology

This book presents the advances in super-resolution microscopy in physics and biomedical optics for nanoscale imaging. In the last decade, super-resolved fluorescence imaging has opened new horizons in improving the resolution of optical microscopes far beyond the classical diffraction limit, leading to the Nobel Prize in Chemistry in 2014. This book represents the first comprehensive review of a different type of super-resolved microscopy, which does not rely on using fluorescent markers. Such label-free super-resolution microscopy enables potentially even broader applications in life sciences and nanoscale imaging, but is much more challenging and it is based on different physical concepts and approaches. A unique feature of this book is that it combines insights into mechanisms of label-free super-resolution with a vast range of applications from fast imaging of living cells to inorganic nanostructures. This book can be used by researchers in biological and medical physics. Due to its logically organizational structure, it can be also used as a teaching tool in graduate and upper-division undergraduate-level courses devoted to super-resolved microscopy, nanoscale imaging, microscopy instrumentation, and biomedical imaging.

Open Microfluidics

This book documents the effects of natural hazards on coastal ecosystems in detail. The sea is an indispensable component of the Earth system, and human societies obtain many goods and services from the marine environment. Global warming threatens marine ecosystems through seawater temperature rise, acidification, sea-level rise and the increased frequency of severe storms. The repeated effects of tsunamis also have major impacts on coastal ecosystems. Increases in population and industry activities along the coast cause the degradation of coastal ecosystems through direct and indirect uses of the environment such as reclamation, overexploitation of bioresources, and pollution. Given these facts, we need to improve our understanding of the physical, chemical and biological mechanisms characterizing marine ecosystems, in order to better measure the effects of anthropogenic and natural impacts on the sea and its ecosystems. Equipped with a comprehensive understanding of the sea, including the effects of the main pressures on it, we will have a better idea of the future state of the sea based on several scenarios of global warming. The 16th France-Japan Symposium on Marine Science focused on using advances in oceanography to better understand the current status of the sea from physical, chemical, biological and ecological perspectives, including fishery sciences and integrated approaches.

Extraction of Natural Products Using Near-Critical Solvents

This volume is comprised of a collection of experimental protocols for common techniques and strategies used to study the biogenesis of b-barrel outer membrane proteins in Gram-negative bacteria. The BAM Complex: Methods and Protocols guides readers through methods on the function of the BAM complex, the roles played by each of the individual components, the expression and purification of the components, crystallization and structure determination of the components, and how the individual Bam components may assemble into a functional complex. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting-edge, The BAM Complex: Methods and Protocols will serve as an invaluable reference for those interested in studying the BAM complex.

Label-Free Super-Resolution Microscopy

The NATO Advanced Study Institute on "Functional Gradient Materials and Surface Layers Prepared by Fine Particles Technology" was held in Kiev (Ukraine) on June 18- 28, 2000 where more than 90 participants, ranging from Ph.D. students to experienced senior scientists, met and exchanged ideas. This meeting was aimed at stimulating the research work across traditional disciplinary lines by bringing together scientists from diverse research areas related to functional gradient materials and surface layers. It also intended to give opportunities for initiating collaborative works between scientists from NATO and Partner countries and to trigger fruitful and exciting discussions between experienced and young researchers. In this respect, this NATO-ASI has been quite successful. The term of functional gradient materials which originates from Japan in the 1980's describes a class of engineering materials with spatially inhomogeneous microstructures and properties (MRS Bulletin, 1995,20, N°l). These materials can be successfully utilized in various applications like electronic devices, optical films, anti wear and anti-corrosion coatings, thermal barrier coatings, biomaterials, to name only a few. Although these functional gradient materials are not fundamentally new, the use of nanoparticles in their fabrication and in surface layers as well has greatly improved their performances to meet challenging requirements for industrial applications.

Nucleic Acid Amplification Strategies for Biosensing, Bioimaging and Biomedicine

It has been thirty years since one of the authors (EJD) began a collaboration with Professor Milton Kerker at Clarkson University in Potsdam, New York using light scattering methods to study aerosol processes. The development of a relatively short-lived commercial particle levitator based on a modification of the Millikan oil drop experiment attracted their attention and led the author to the study of single droplets and solid microparticles by levitation methods. The early work on measurements of droplet evaporation rates using light scattering techniques to determine the size slowly expanded and diversified as better instrumentation was developed, and faster computers made it possible to perform Mie theory light

scattering calculations with ease. Several milestones can be identified in the progress of single microparticle studies. The first is the introduction of the electrodynamic balance, which provided more robust trapping of a particle. The electrodynamic levitator, which has played an important role in atomic and molecular ion spectroscopy, leading to the Nobel Prize in Physics in 1989 shared by Wolfgang Paul of Bonn University and Hans Dehmelt of the University of Washington, was easily adapted to trap microparticles. Simultaneously, improvements in detectors for acquiring and storing light scattering data and theoretical and experimental studies of the interesting optical properties of microspheres, especially the work on morphology dependent resonances by Arthur Ashkin at the Bell Laboratories, Richard Chang, from Yale University, and Tony Campillo from the Naval Research Laboratories in Washington D. C.

Differential Ion Mobility Spectrometry

This book brings together the many concepts and discoveries in liquid crystal colloids contributed over the last twenty years and scattered across numerous articles and book chapters. It provides both a historical overview of the development of the field and a clear perspective on the future applications in photonics. The book covers all phenomena observed in liquid crystal colloids with an emphasis on experimental tools and applications of topology in condensed matter, as well as practical micro-photonics applications. It includes a number of spectacular manifestations of new topological phenomena not found or difficult to observe in other systems. Starting from the early works on nematic colloids, it explains the basics of topological defects in ordered media, charge and winding, and the elastic forces between colloidal particles in nematics. Following a detailed description of experimental methods, such as optical tweezing and particle tracking, the book eases the reader into the theoretical part, which deals with elastic deformation of nematic liquid crystals due to inclusions and surface alignment. This is discussed in the context of basic mean field Landau-de Gennes Q-tensor theory, with a brief explanation of the free-energy minimization numerical methods. There then follows an excursion into the topology of complex nematic colloidal structures, colloidal entanglement, knotting and linking. Nematic droplets, shells, handlebodies and chiral topological structures are addressed in separate chapters. The book concludes with an extensive chapter on the photonic properties of nematic dispersions, presenting the concept of integrated soft matter photonics and discussing the concepts of nematic and chiral nematic microlasers, surface-sensitive photonic devices and smectic microfibers. The text is complemented by a large bibliography, explanatory sketches and beautiful micrographs.

Light-Active Functional Organic Materials

This text presents a general introduction to soft tissue biomechanics. One of its primary goals is to introduce basic analytical, experimental and computational methods. In doing so, it enables readers to gain a relatively complete understanding of the biomechanics of the heart and vasculature.

Organic Lasers

Oceanography Challenges to Future Earth

The application of microfluidics to biotechnology is an exciting new area that has already begun to revolutionize how researchers study and manipulate macromolecules like DNA, proteins and cells in vitro and within living organisms. Now in a newly revised and expanded second edition, the Artech House bestseller, Microfluidics for Biotechnology brings you to the cutting edge of this burgeoning field. Among the numerous updates, the second edition features three entirely new chapters on: non-dimensional numbers in microfluidics; interface, capillarity and microdrops; and digital, two-phase and droplet microfluidics.Presenting an enlightening balance of numerical approaches, theory, and experimental examples, this book provides a detailed look at the mechanical behavior of the different types of micro/nano particles and macromolecules that are used in biotechnology. You gain a solid understanding of microfluidics theory and the mechanics of microflows and microdrops. The book examines the diffusion of species and nanoparticles, including continuous flow and discrete Monte-Carlo methods.This unique volume describes the transport and dispersion of biochemical species and particles. You learn how to model biochemical reactions, including DNA hybridization and enzymatic reactions. Moreover, the book helps you master the theory, applications, and modeling of magnetic beads behavior and provides an overview of self-assembly and magnetic composite. Other key topics include the electric manipulation of micro/nanoparticles and macromolecules and the experimental aspects of biological macromolecule manipulation.

Optical Processes in Microcavities

The aim of this book is to present the current state of the art of extracting natural products with near-critical solvents and to view the possibilities of further extensions of the technique. Relevant background theory is given but does not dominate the book. Carbon dioxide is the near-critical solvent used in most recent applications and inevitably receives prominence. In addition to general descriptions and reviews, the book contains three chapters by indus trial practitioners who describe in detail the operation of their processes and discuss the market for their products. Sections on the design of the pressure vessels and pumps required in these processes and on the acquisition of the data required for design are included. The costing of the processes is also discussed. There is good scope for combining a near-critical extraction step with other process steps in which the properties of near-critical solvents are utilised, for example as a reaction or crystallisation medium and a chapter is devoted to these important aspects. It is hoped that the work will be found to contain a great deal of specific information of use to those already familiar with this field. However the style of presentation and content is such that it will also be useful as an introduction. In particular it will be helpful to those wondering if this form of separation

method has anything to offer for them, whether they are engineers, chemists or managers in industry, or in academic or research institutions.

Microfluidics

In this 2nd edition of Micro-Drops and Digital Microfluidics, Jean Berthier explores the fundamentals and applications of digital microfluidics, enabling engineers and scientists to design this important enabling technology into devices and harness the considerable potential of digital microfluidics in testing and data collection. This book describes the most recent developments in digital microfluidics, with a specific focus on the computational, theoretical and experimental study of microdrops. Unique in its emphasis on digital microfluidics and with diverse applications ranging from drug delivery to point-of-care diagnostic chips, organic synthesis to microreactors, Micro-Drops and Digital Microfluidics meets the needs of audiences across the fields of bioengineering and biotechnology, and electrical and chemical engineering. Authoritative reporting on the latest changes in microfluidic science, where microscopic liquid volumes are handled as ""microdrops"" and separately from ""nanodrops." A methodical examination of how liquid microdrops behave in the complex geometries of modern miniaturized systems and interact with different morphological (micro-fabricated, textured) solid substrates A thorough explanation of how capillary forces act on liquid interfaces in contact with micro-fabricated surfaces Analysis of how droplets can be manipulated, handled, or transported using electric fields (electrowetting), acoustic actuation (surface acoustic waves), or by a carrier liquid (microflow) A fresh perspective on the future of microfluidics

Green Chemistry and Sustainable Technology

In the present book, various applications of microfluidics and nanofluidics are introduced. Microfluidics and nanofluidics span a broad array of disciplines including mechanical, materials, and electrical engineering, surface science, chemistry, physics and biology. Also, this book deals with transport and interactions of colloidal particles and biomolecules in microchannels, which have great importance to many microfluidic applications, such as drug delivery in life science, microchannel heat exchangers in electronic cooling, and food processing industry. Furthermore, this book focuses on a detailed description of the thermal transport behavior, challenges and implications that involve the development and use of HTFs under the influence of atomistic-scale structures and industrial applications.

The Physics of Microdroplets

Microfluidic techniques are becoming widely incorporated into medical diagnostic systems due to the inherent advantages of miniaturization. In Microfluidic Diagnostics: Methods in Molecular Biology, researchers in the field detail methods and

protocols covering subjects such as microfluidic device fabrication, on-chip sample preparation, diagnostic applications and detection methodologies. The protocols described range from cutting-edge developments to established techniques and basic demonstrations suitable for education and training; from basic fabrication methods to commercializing research. Written in the highly successful Methods in Molecular BiologyTM series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and key tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, Microfluidic Diagnostics: Methods in Molecular Biology seeks to aid scientists in the further development and commercialization of microfluidic diagnostic technologies

Optical Microcavities

Inspired by naturally occurring light-active molecular systems such as photosynthesis, scientists have long devoted their efforts to understanding how light and molecules interact. Based on a raft of knowledge on light absorption, energy migration and electron transfer, fluorescence and phosphorescence, and various photochemical reactions, light can now be utilized for energy conversion, information storage, medical applications, and development of next-generation photofunctional materials that cannot be obtained via conventional organic synthesis. This book overviews some of the cutting-edge p-conjugated molecular and polymer materials for organic photovoltaics, artificial photosynthesis, and organic light-emitting devices. It gives insights into the interactions between light and molecules and discusses sophisticated molecular designs, self-assembly and self-organization strategies, and state-of-the-art unconventional analytical methods.

Protein Engineering Handbook

With the recent advent of nanotechnology, research and development in the area of nanostructured materials has gained unprecedented prominence. Novel materials with potentially exciting new applications are being discovered at a much higher rate than ever before. Innovative tools to fabricate, manipulate, characterize and evaluate such materials are being developed and expanded. To keep pace with this extremely rapid growth, it is necessary to take a breath from time to time, to critically assess the current knowledge and provide thoughts for future developments. This book represents one of these moments, as a number of prominent scientists in nanostructured materials join forces to provide insightful reviews of their areas of expertise, thus offering an overall picture of the state-- the art of the field. Nanostructured materials designate an increasing number of materials with designed shapes, surfaces, structures, pore systems, etc. Nanostructured materials with modified surfaces include those whose surfaces have been altered via such techniques as grafting and tethering of organic or organometallic species, or through various deposition procedures including electro, electroless and vapor deposition, or simple adsorption. These materials find important applications in catalysis, separation and environmental

remediation. Materials with patterned surfaces, which are essential for the optoelectronics industry, constitute another important class of surface-modified nanostructured materials. Other materials are considered nanostructured because of their composition and internal organization.

Food Process Engineering and Quality Assurance

This textbook explores both the theoretical foundation of the Finite Volume Method (FVM) and its applications in Computational Fluid Dynamics (CFD). Readers will discover a thorough explanation of the FVM numerics and algorithms used for the simulation of incompressible and compressible fluid flows, along with a detailed examination of the components needed for the development of a collocated unstructured pressure-based CFD solver. Two particular CFD codes are explored. The first is uFVM, a three-dimensional unstructured pressure-based finite volume academic CFD code, implemented within Matlab. The second is OpenFOAM®, an open source framework used in the development of a range of CFD programs for the simulation of industrial scale flow problems. With over 220 figures, numerous examples and more than one hundred exercise on FVM numerics, programming, and applications, this textbook is suitable for use in an introductory course on the FVM, in an advanced course on numerics, and as a reference for CFD programmers and researchers.

The Finite Volume Method in Computational Fluid Dynamics

Open microfluidics or open-surface is becoming fundamental in scientific domains such as biotechnology, biology and space. First, such systems and devices based on open microfluidics make use of capillary forces to move fluids, without any need for external energy. Second, the “openness” of the flow facilitates the accessibility to the liquid in biotechnology and biology, and reduces the weight in space applications. This book has been conceived to give the reader the fundamental basis of open microfluidics. It covers successively The theory of spontaneous capillary flow, with the general conditions for spontaneous capillary flow, and the dynamic aspects of such flows. The formation of capillary filaments which are associated to small contact angles and sharp grooves. The study of capillary flow in open rectangular, pseudo-rectangular and trapezoidal open microchannels. The dynamics of open capillary flows in grooves with a focus on capillary resistors. The case of very viscous liquids is analyzed. An analysis of suspended capillary flows: such flows move in suspended channels devoid of top cover and bottom plate. Their accessibility is reinforced, and such systems are becoming fundamental in biology. An analysis of “rails” microfluidics, which are flows that move in channels devoid of side walls. This geometry has the advantage to be compatible with capillary networks, which are now of great interest in biotechnology, for molecular detection for example. Paper-based microfluidics where liquids wick flat paper matrix. Applications concern bioassays such as point of care devices (POC). Thread-based microfluidics is a new domain of investigation. It is seeing presently many new

developments in the domain of separation and filtration, and opens the way to smart bandages and tissue engineering. The book is intended to cover the theoretical aspects of open microfluidics, experimental approaches, and examples of application.

Nanostructured Catalysts

Optical microcavities are structures that enable confinement of light to microscale volumes. The universal importance of these structures has made them indispensable to a wide range of fields. This important book describes the many applications and the related physics, providing both a review and a tutorial of key subjects by leading researchers from each field. The topics include cavity QED and quantum information, nanophotonics and nanostructure interactions, wavelength switching and modulation in optical communications, optical chaos and biosensors.

Applications of Microfluidic Systems in Biology and Medicine

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.

Biosensors

This Festschrift is a tribute to the eminent scholar, Professor Richard Kounai Chang, on his retirement from Yale University on June 12, 2008. During his over four decades of scientific exploration, Professor Chang has made a lasting contribution to the development of linear and nonlinear optics and devices in confined geometries, of surface second-harmonic generation and surface-enhanced Raman scattering, and of novel methods for detecting airborne aerosol pathogens. This volume assembles a collection of articles contributed by former students, collaborators, and colleagues of Professor Chang all over the world. The topics span a diverse scope in applied optics frontiers, many of which are rooted in Professor Chang's pioneering research.

Principles and Techniques of Biochemistry and Molecular Biology

The first book to paint a complete picture of the challenges of processing functional nanomaterials for printed electronics devices, and additive manufacturing fabrication processes. Following an introduction to printed electronics, the book focuses on various functional nanomaterials available, including conducting, semi-conducting, dielectric, polymeric, ceramic and tailored nanomaterials. Subsequent sections cover the preparation and characterization of such materials along with their formulation and preparation as inkjet inks, as well as a selection of applications. These include printed interconnects, passive and active modules, as well as such high-tech devices as solar cells, transparent electrodes, displays, touch screens, sensors, RFID tags and 3D objects. The book concludes with a look at the future for printed nanomaterials. For all those working in the field of printed electronics, from entrants to specialized researchers, in a number of disciplines ranging from chemistry and materials science to engineering and manufacturing, in both academia and industry.

Optical Processes in Microparticles and Nanostructures

This best-selling undergraduate textbook provides an introduction to key experimental techniques from across the biosciences. It uniquely integrates the theories and practices that drive the fields of biology and medicine, comprehensively covering both the methods students will encounter in lab classes and those that underpin recent advances and discoveries. Its problem-solving approach continues with worked examples that set a challenge and then show students how the challenge is met. New to this edition are case studies, for example, that illustrate the relevance of the principles and techniques to the diagnosis and treatment of individual patients. Coverage is expanded to include a section on stem cells, chapters on immunochemical techniques and spectroscopy techniques, and additional chapters on drug discovery and development, and clinical biochemistry. Experimental design and the statistical analysis of data are emphasised throughout to ensure students are equipped to successfully plan their own experiments and examine the results obtained.

Natural Gas Engineering and Safety Challenges

Gordon J. Miller, Michael W. Schmidt, Fei Wang, Tae-Soo You: Quantitative Advances in the Zintl-Klemm Formalism Jürgen Evers: High Pressure Investigations on AIBIII Zintl Compounds (AI = Li to Cs; BIII = Al to Tl) up to 30 GPa Andrei Shevelkov, Kirill Kovnir: Zintl Clathrates Ulrich Häussermann, Verina F. Kranak, Kati Puhakainen: Hydrogenous Zintl Phases: Interstitial versus Polyanionic Hydrides

Microfluidics

Taking an interdisciplinary approach, this new volume brings together innovative research, new concepts, and novel developments in the application of new tools in green chemistry and sustainable technology. The diverse coverage includes chapters on ionic liquids as green solvents, an environmentally friendly approach to the synthesis and biological evaluation of α-aminophosphonate derivatives, the application of nanotechnology in biological sciences and green chemistry, eco-friendly polymers, the effect of global warming and greenhouse gases on environmental system, and more.

Cardiovascular Solid Mechanics

Providing a critical and extensive compilation of the downstream processes of natural gas that involve the principle of gas processing , transmission and distribution, gas flow and network analysis, instrumentation and measurement systems and its utilisation, this book also serves to enrich readers understanding of the business and management aspects of natural gas and highlights some of the recent research and innovations in the field. Featuring extensive coverage of the design and pipeline failures and safety challenges in terms of fire and explosions relating to the downstream of natural gas technology, the book covers the needs of practising engineers from different disciplines, who may include project and operations managers, planning and design engineers as well as undergraduate and postgraduate students in the field of gas, petroleum and chemical engineering. This book also includes several case studies to illustrate the analysis of the downstream process in the gas and oil industry. Of interest to researchers is the field of flame and mitigation of explosion: the fundamental processes involved are also discussed, including outlines of contemporary and possible future research and challenges in the different fields.

Functional Gradient Materials and Surface Layers Prepared by Fine Particles Technology

The dielectric microstructures act as ultrahigh Q factors optical cavities, which modify the spontaneous emission rates and alter the spatial distributions of the input and output radiation. The editors have selected leading scientists who have made seminal contributions in different aspects of optical processes in microcavities. Every attempt has been made to unify the underlying physics pertaining to microcavities of various shapes. This book begins with a chapter on the role of microcavity modes with additional chapters on how these microcavity modes affect the spontaneous and stimulated emission rates, enhance nonlinear optical processes, used in cavity-QED and chemical physics experiments, aid in single-molecule detection, influence the design of microdisk semiconductor lasers, and how deformed cavities can be treated with classical chaos theory. Contents:The Role of Quasinormal Modes (E S-C Ching et al.)Optical Mode Density and Spontaneous Emission in Microcavities (S D Brorson & P M W Skovgaard)Very High Q Whispering-Gallery Modes in Silica Microspheres for Cavity-QED Experiments (V Lefèvre-Seguin et al.)Molecular Fluorescence in a Microcavity: Solvation Dynamics and Single Molecule Detection (M D Barnes et al.)Cavity QED Modified Stimulated and Spontaneous Processes in Microdroplets (A J Campillo et

al.)Perturbation Effects on the Resonances of a Spherical Dielectric Microcavity (M M Mazumder et al.)Nonlinear Optical Effects in Microcylinders and Microdroplets (R L Armstrong)The Role of MDRs in Chemical Physics: Intermolecular Energy Transfer in Microdroplets (S Arnold et al.)Dynamic Optical Processes in Microdisk Lasers (R E Slusher & U Mohideen)Dielectric Photonic Wells and Wires and Spontaneous Emission Coupling Efficiency of Microdisk and Photonic-Wire Semiconductor Lasers (S-T Ho et al.)Chaotic Light: A Theory of Asymmetric Resonant Cavities (J U Nöckel & A D Stone) Readership: Scientists interested in the optics of microcavities, droplets, cavity quantum electrodynamics, nonlinear optics, laser diagnostics, advanced undergraduates and graduates. keywords:Microcavity;Lasing;Whispering Gallery Mode (WGM);Morphology Dependent Resonances (MDR);Cavity Quantum Electrodynamics (CQED);Q-Factor;Microdroplets;Micro Cyclinders;Micro-Disks;Modified Emission

Microfluidic Diagnostics

In the past 30 years, organic conjugated molecules have received a lot of attention in research because of their unique combination of active properties typical of semiconductors and the technological appeal typical of plastic materials. Among the different applications proposed for organic materials, organic lasers are quickly approaching the performance required in real devices, while research on novel active materials is still ongoing. The book covers the basic aspects of the measurement techniques of optical gain and amplified spontaneous emission (ASE) in organic films as well as the photophysics of organic materials that can be understood using ASE measurements. It reviews the recent advances in the development of new active materials for organic lasers as well as the actual state of the art of scattering-assisted random lasers and of strongly coupled organic microcavities, both promising interesting developments in the near future. Finally, it gives a detailed review of the state of the art of the organic lasers actually closest to real applications, namely external cavity lasers and distributed feedback lasers. The book is unique that it covers basic aspects, technological aspects, and systems, which are still a subject of basic science research.

Catalyst Preparation

This book focuses on state-of-the-art microfluidic research in medical and biological applications. The top-level researchers in this research field explain carefully and clearly what can be done by using microfluidic devices. Beginners in the field —undergraduates, engineers, biologists, medical researchers—will easily learn to understand microfluidic-based medical and biological applications. Because a wide range of topics is summarized here, it also helps experts to learn more about fields outside their own specialties. The book covers many interesting subjects, including cell separation, protein crystallization, single-cell analysis, cell diagnosis, point-of-care testing, immunoassay, embyos/worms on a chip and organ-on-a-chip. Readers will be convinced that microfluidic devices have great potential for medical and biological applications.

Micro-Drops and Digital Microfluidics

Single Molecule Spectroscopy is one of the hottest topics in today's chemistry. It brings us close to the the most exciting vision generations of chemists have been dreaming of: To observe and examine single molecules! While most of chemistry deals with myriads of molecules, this books presents the latest developments for the detection and investigation of single entities. Written by internationally renowned authors, it is a thorough and comprehensive survey of current methods and their applications.

Liquid Crystal Colloids

Over the last decade, scientific and engineering interests have been shifting from conventional ion mobility spectrometry (IMS) to field asymmetric waveform ion mobility spectrometry (FAIMS). Differential Ion Mobility Spectrometry: Nonlinear Ion Transport and Fundamentals of FAIMS explores this new analytical technology that separates and characterizes ions by the difference between their mobility in gases at high and low electric fields. It also covers the novel topics of higher-order differential IMS and IMS with alignment of dipole direction. The book relates the fundamentals of FAIMS and other nonlinear IMS methods to the physics of gas-phase ion transport. It begins with the basics of ion diffusion and mobility in gases, covering the main attributes of conventional IMS that are relevant to all IMS approaches. Building on this foundation, the author reviews diverse high-field transport phenomena that underlie differential IMS. He discusses the conceptual implementation and first-principles optimization of FAIMS as a filtering technique, emphasizing the dependence of FAIMS performance metrics on instrumental parameters and properties of ion species. He also explores ion reactions in FAIMS caused by field heating and the effects of inhomogeneous electric field in curved FAIMS gaps. Written by an accomplished scientist in the field, this state-of-the-art book supplies the foundation to understand the new technology of nonlinear IMS methods.

Zintl Phases

Focusing on a lucrative and increasingly important area of biomedicine, the Biomaterials Fabrication and Processing Handbook brings together various biomaterials production and processing aspects, including tissue engineering scaffold materials, drug delivery systems, nanobiomaterials, and biosensors. With contributions from renowned international experts and extensive reference lists in each chapter, the volume provides detailed, practical information to produce and use biomaterials. The different facets of biomaterials technology are split into four sections in the book— Part I The development of new materials and devices capable of interacting specifically with biological tissues and the preparation of scaffolds using materials with appropriate composition and structure Part II The necessary materials to create a drug

delivery system capable of controlled release and the incorporation of drug reservoirs into implantable devices for sustained controlled release Part III The significant role nanotechnology plays in the biomedical and biotechnology fields Part IV More biomaterials, including synthetic and natural degradable polymeric biomaterials, electroactive polymers as smart materials, and biomaterials for gastrointestinal and cartilage repair and reconstruction

Single-Molecule Optical Detection, Imaging and Spectroscopy

Microdroplet technology has recently emerged to provide new and diverse applications via microfluidic functionality, especially in various areas of biology and chemistry. This book, then, gives an overview of the principle components and wide-ranging applications for state-of-the-art of droplet-based microfluidics. Chapter authors are internationally-leading researchers from chemistry, biology, physics and engineering that present various key aspects of micrdroplet technology -- fundamental flow physics, methodology and components for flow control, applications in biology and chemistry, and a discussion of future perspectives. This book acts as a reference for academics, post-graduate students, and researcher wishing to deepen their understand of microfluidics and introduce optimal design and operation of new droplet-based microfluidic devices for more comprehensive analyte assessments.

The BAM Complex

Unparalleled in size and scope, this new major reference integrates academic and industrial knowledge into a single resource, allowing for a unique overview of the entire field. Adopting a systematic and practice-oriented approach, and including a wide range of technical and methodological information, this highly accessible handbook is an invaluable 'toolbox' for any bioengineer. In two massive volumes, it covers the full spectrum of current concepts, methods and application areas.

Nano-Optics: Principles Enabling Basic Research and Applications

This new book, Food Process Engineering and Quality Assurance, provides an abundance of valuable new research and studies in novel technologies used in food processing and quality assurance issues of food. The 750-page book gives a detailed technical and scientific background of various food processing technologies that are relevant to the industry. The food process related application of engineering technology involves interdisciplinary teamwork, which, in addition to the expertise of interdisciplinary engineers, draws on that of food technologists, microbiologists, chemists, mechanical engineers, biochemists, geneticists, and others. The processes and methods described in the book are applicable to many areas of the food industry, including drying, milling, extrusion, refrigeration, heat and mass transfer, membrane-based

separation, concentration, centrifugation, fluid flow and blending, powder and bulk-solids mixing, pneumatic conveying, and process modeling, monitoring, and control. Food process engineering know-how can be credited with improving the conversion of raw foodstuffs into safe consumer products of the highest possible quality. This book looks at advanced materials and techniques used for, among other things, chemical and heat sterilization, advanced packaging, and monitoring and control, which are essential to the highly automated facilities for the high-throughput production of safe food products. With contributions from prominent scientists from around the world, this volume provides an abundance of valuable new research and studies on novel technologies used in food processing and quality assurance issues. It gives a detailed technical and scientific background of various food processing technologies that are relevant to the industry. Special emphasis is given to the processing of fish, candelilla, dairy, and bakery products. Rapid detection of pathogens and toxins and application of nanotechnology in ensuring food safety are also emphasized. Key features: • Presents recent research development with applications • Discusses new technology and processes in food process engineering • Provides several chapters on candelilla (which is frequently used as a food additive but can also be used in cosmetics, drugs, etc.), covering its characteristics, common uses, geographical distribution, and more

Biomaterials Fabrication and Processing Handbook

The Physics of Microdroplets gives the reader the theoretical and numerical tools to understand, explain, calculate, and predict the often nonintuitive observed behavior of droplets in microsystems. Microdrops and interfaces are now a common feature in most fluidic microsystems, from biology, to biotechnology, materials science, 3D-microelectronics, optofluidics, and mechatronics. On the other hand, the behavior of droplets and interfaces in today's microsystems is complicated and involves complex 3D geometrical considerations. From a numerical standpoint, the treatment of interfaces separating different immiscible phases is difficult. After a chapter dedicated to the general theory of wetting, this practical book successively details: The theory of 3D liquid interfaces The formulas for volume and surface of sessile and pancake droplets The behavior of sessile droplets The behavior of droplets between tapered plates and in wedges The behavior of droplets in microchannels The effect of capillarity with the analysis of capillary rise The onset of spontaneous capillary flow in open microfluidic systems The interaction between droplets, like engulfment The theory and application of electrowetting The state of the art for the approach of 3D-microelectronics using capillary alignment

Microfluidics for Biotechnology