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The near-field region within an order of 100 nm from the solid interface is an exciting and crucial arena where many important multiscale transport phenomena are physically characterized, such as flow mixing and drag, heat and mass transfer, near-wall behavior of nanoparticles, binding of bio-molecules, crystallization, surface deposition processes, just naming a few.

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The near-field region within an order of 100 nm from the solid interface is an exciting and crucial arena where many important multiscale transport phenomena are physically characterized, such as flow mixing and drag, heat and mass transfer, near-wall behavior of nanoparticles, binding of bio-molecules, crystallization, surface deposition processes, just naming a few. This monograph presents a number of label-free experimental techniques developed and tested for near-field fluid flow characterization. Namely, these include Total Internal Reflection Microscopy (TIRM), Optical Serial Sectioning Microscopy (OSSM), Surface Plasmon Resonance Microscopy (SPRM), Interference Reflection Contrast Microscopy (IRCM), Thermal Near-Field Anemometry, Scanning Thermal Microscopy (STM), and Micro-Cantilever Near-Field Thermometry. Presentation on each of these is laid out for the working principle, how to implement the system, and its example applications, to promote the readers understanding and knowledge of the specific technique that can be applied for their own research interests.

Recent advances in technologies have created a need for sensing and measuring temperature at the nanoscale. This challenge requires new approaches and new techniques, since conventional thermometry is not valid at this scale. Thermometry at the Nanoscale covers the fundamentals of the subject, followed by individual chapters on luminescence-based and non-luminescence based thermometry techniques, and finally specific chapters on different applications of nanothermometry. The fundamental topics covered include a review of temperature measurement, the meaning of temperature on the nanoscale and heat propagation at the nanoscale. Luminescence-based techniques covered include quantum dots thermometry; lanthanide phosphors thermometry; organic dyes thermometry; polymer-based thermometry and organic-inorganic hybrids thermometry. Non-luminescence based thermometry techniques include scanning thermal microscopy; near-field thermometry and nanotubes thermometry. The range of applications of nanothermometry discussed includes thermometry inside a cell; microelectronics and micro/nanonofluidics. This is the first book to cover the whole subject of thermometry at the nanoscale with specialists in each particular technique discussing in detail the recent achievements and limitations as well as future trends and technological possibilities. The book will appeal to researchers from materials science, physical chemistry, analytical chemistry and biological sciences working on the

development of new materials, materials characterisation/analysis and their applications.

Subwavelength and Nanometer Diameter Optical Fibers provides a comprehensive and up-to-date coverage of research on nanoscale optical fibers including the basic physics and engineering aspects of the fabrication, properties and applications. The book discusses optical micro/nanofibers that represent a perfect fusion of optical fibers and nanotechnology on subwavelength scale and covers a broad range of topics in modern optical engineering, photonics and nanotechnology spanning from fiber optics, near-field optics, nonlinear optics, atom optics to nanofabrication and microphotonic components/devices. It is intended for researchers and graduate students in the fields of photonics, nanotechnology, optical engineering and materials science. Dr. Limin Tong is a professor at Department of Optical Engineering and State Key Laboratory of Modern Optical Instrumentation of Zhejiang University, China; Dr. Michael Sumetsky is a researcher at OFS Laboratories, USA.

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

Micro/Nano mechatronics is currently used in broader spectra, ranging from basic applications in robotics, actuators, sensors, semiconductors, automobiles, and machine tools. As a strategic technology highlighting the 21st century, this technology is extended to new applications in bio-medical systems and life science, construction machines, and aerospace equipment, welfare/human life engineering, and other brand new scopes. Basically, the miniaturizing technology is important to realize high performance, low energy consumption, low cost performance, small space instrumentation, light-weight, and so on. This book presents the summary of our project Center of Excellence for Education and Research of Micro-Nano Mechatronics. The project implements a strategy to realize applications of micro-nano mechatronics, which are based on mechanical engineering or materials science, control systems engineering, and advanced medical engineering. The chapters describe the research advances in micro/nano measurement and control, micro/nano design and manufacturing, nano materials science, and their applications in biomedical engineering. The publication of this book was supported by Nagoya University, the 21st COE program "Micro- and NanoMechatronics for Information-Based Society," and the global COE program “ COE for Education and Research of Micro-Nano Mechatronics. ”

This book offers a comprehensive review of the state-of-the-art in innovative Beyond-CMOS nanodevices for developing novel functionalities, logic and memories dedicated to researchers, engineers and students. It particularly focuses on the interest of nanostructures and nanodevices (nanowires, small slope switches, 2D layers, nanostructured materials, etc.) for advanced More than Moore (RF-nanosensors-energy harvesters, on-chip electronic cooling, etc.) and Beyond-CMOS logic and memories applications.

Making a clear distinction is made between nano- and micro-mechanical testing for physical reasons, this monograph describes the basics and applications of the supermicroscopies AFM and SNOM, and of the nanomechanical testing on rough and technical natural surfaces in the submicron range down to a lateral resolution of a few nm. New or improved instrumentation, new physical laws and unforeseen new applications in all branches of natural sciences (around physics, chemistry, mineralogy, materials science, biology and medicine) and nanotechnology are covered as well as the sources for pitfalls and

errors. It outlines the handling of natural and technical samples in relation to those of flat standard samples and emphasizes new special features. Pitfalls and sources of errors are clearly demonstrated as well as their efficient remedy when going from molecularly flat to rough surfaces. The academic or industrial scientist learns how to apply the principles for tackling their scientific or manufacturing tasks that include roughness far away from standard samples.

Implantable microdevices, providing accurate measurement of target analytes in animals and humans, have always been important in biological science, medical diagnostics, clinical therapy, and personal healthcare. Recently, there have been increasing unmet needs for developing high-performance implants that are small, minimally-invasive, biocompatible, long-term stable, and cost-effective. Therefore, the aim of this Special Issue is to bring together state-of-the-art research and development contributions that address key challenges and topics related to implantable microdevices. Applications of primary interest include, but are not limited to, miniaturized optical sensing and imaging tools, implantable sensors for detecting biochemical species and/or metabolites, transducers for measuring biophysical quantities (e.g., pressure and/or strain), and neural prosthetic devices.

This book provides an introduction to robot-based nanohandling. It presents work on the development of a versatile microrobot-based nanohandling robot station inside a scanning electron microscope (SEM). Those unfamiliar with the subject will find the text, which is complemented throughout by the extensive use of illustrations, clear and simple to understand. The author has published two books and numerous papers in the field, and holds more than 50 patents.

This book focuses on a research field that is rapidly emerging as one of the most promising ones for the global optics and photonics community: the “ lab-on-fiber ” technology. Inspired by the well-established "lab on-a-chip" concept, this new technology essentially envisages novel and highly functionalized devices completely integrated into a single optical fiber for both communication and sensing applications. Based on the R&D experience of some of the world's leading authorities in the fields of optics, photonics, nanotechnology, and material science, this book provides a broad and accurate description of the main developments and achievements in the lab-on-fiber technology roadmap, also highlighting the new perspectives and challenges to be faced. This book is essential for scientists interested in the cutting-edge fiber optic technology, but also for graduate students.