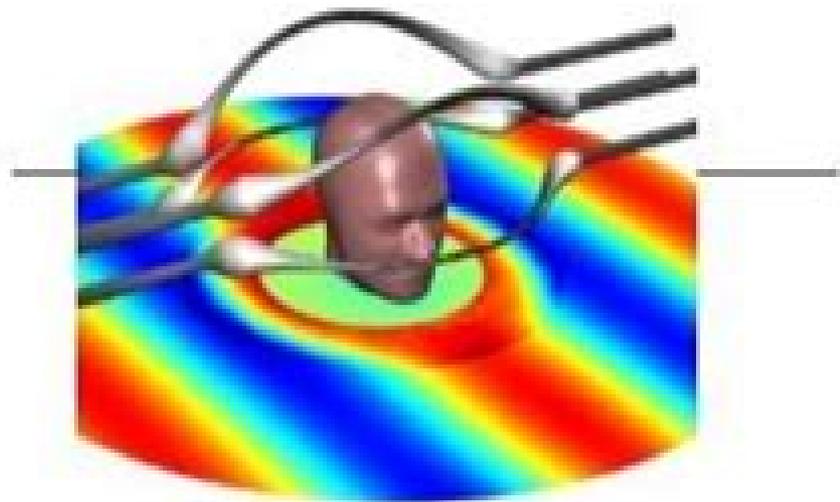
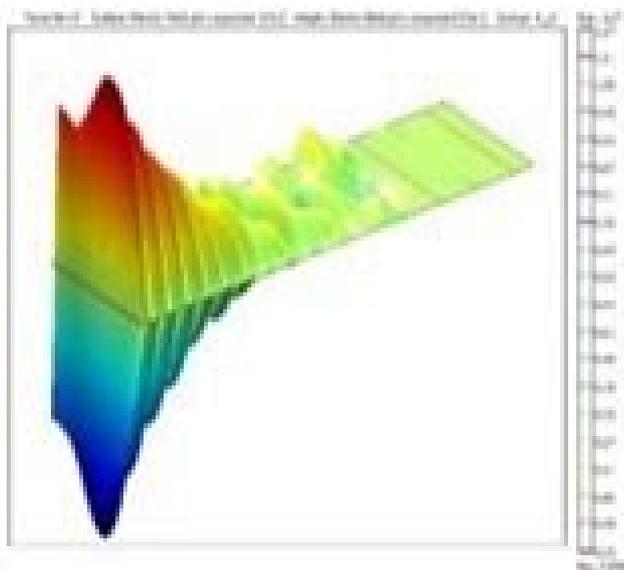


Nano-Photonics and Plasmonics in COMSOL Multiphysics



Speaker: Dr. Thierry Luthy (COMSOL GmbH, Zurich)
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Nano Photonics And Plasmonics In Comsol Multiphysics

Ching Eng Png, Yuriy Akimov



Nano Photonics And Plasmonics In Comsol Multiphysics:

Materials for Nanophotonics - Plasmonics, Metamaterials and Light Localization: Volume 1182 Luca Dal

Negro,2009-11-19 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners

Amorphous Nanophotonics Carsten Rockstuhl, Toralf Scharf,2013-02-15 This book represents the first comprehensive overview over amorphous nano optical and nano photonic systems Nanophotonics is a burgeoning branch of optics that enables many applications by steering the mould of light on length scales smaller than the wavelength with devoted nanostructures Amorphous nanophotonics exploits self organization mechanisms based on bottom up approaches to fabricate nanooptical systems The resulting structures presented in the book are characterized by a deterministic unit cell with tailored geometries but their spatial arrangement is not controlled Instead of periodic the structures appear either amorphous or random The aim of this book is to discuss all aspects related to observable effects in amorphous nanophotonic material and aspects related to their design fabrication characterization and integration into applications The book has an interdisciplinary nature with contributions from scientists in physics chemistry and materials sciences and sheds light on the topic from many directions

Nanoplasmonics Grégory Barbillon,2017-06-21 Nanoplasmonics is a young topic of research which is part of nanophotonics and nano optics Nanoplasmonics concerns to the investigation of electron oscillations in metallic nanostructures and nanoparticles Surface plasmons have optical properties which are very interesting For instance surface plasmons have the unique capacity to confine light at the nanoscale Moreover surface plasmons are very sensitive to the surrounding medium and the properties of the materials on which they propagate In addition to the above the surface plasmon resonances can be controlled by adjusting the size shape periodicity and materials nature All these optical properties can enable a great number of applications such as biosensors optical modulators photodetectors and photovoltaic devices This book is intended for a broad audience and provides an overview of some of the fundamental knowledges and applications of nanoplasmonics

Nanophotonics with Surface Plasmons ,2006-12-18 Current developments in optical technologies are being directed toward nanoscale devices with subwavelength dimensions in which photons are manipulated on the nanoscale Although light is clearly the fastest means to send information to and from the nanoscale there is a fundamental incompatibility between light at the microscale and devices and processes at the nanoscale Nanostructured metals which support surface plasmon modes can concentrate electromagnetic EM fields to a small fraction of a wavelength while enhancing local field strengths by several orders of magnitude For this reason plasmonic nanostructures can serve as optical couplers across the nano micro interface metal dielectric and metal semiconductor nanostructures can act as optical nanoantennae and enhance light matter coupling in nanoscale devices This book describes how one can fully integrate plasmonic nanostructures into dielectric semiconductor and molecular photonic devices for guiding photons across the nano micro interface and for detecting molecules with unsurpassed sensitivity Nanophotonics and Nanoplasmonics Metamaterials

and negative index materials Plasmon enhanced sensing and spectroscopy Imaging and sensing on the nanoscale Metal Optics

Nano-Engineering at Functional Interfaces for Multidisciplinary Applications Sai Sathish Ramamurthy, Seemesh Bhaskar, Narendra Reddy, 2024-10-18 Nano Engineering at Functional Interfaces for Multi disciplinary Applications Electrochemistry Photoplasmonics Antimicrobials and Anticancer Applications provides a comprehensive overview of the fundamentals and latest advances of nano engineering strategies for the design development and fabrication of novel nanostructures for different applications in the fields of photoplasmonics and electrochemistry as well as antibacterial and anticancer research areas The book begins with an introduction to the fundamentals and characteristics of nanostructured interfaces and their associated technologies including an overview of their potential applications in different fields The following chapters present a thorough discussion of the synthesis processing and characterization methods of nanomaterials with unique functionalities suitable for energy harvesting food and textile applications electrocatalysis biomedical applications and more It then concludes outlining research future directions and potential industrial applications Presents the advantages and impact of nano engineering in technological advances with up to date discussions on their applications Covers research directions and potential future applications of nano engineering in industry Includes case studies that illustrate important processes

Proceedings of SIE 2022 Giuseppe Cocorullo, Felice Crupi, Ernesto Limiti, 2023-02-27 This book showcases the state of the art in the field of electronics as presented by researchers and engineers at the 53rd Annual Meeting of the Italian Electronics Society SIE held in Rende CS Italy on September 5 7 2022 It covers a broad range of aspects including integrated circuits and systems micro and nano electronic devices microwave electronics sensors and microsystems optoelectronics and photonics power electronics electronic systems and applications

Nanoscale Networking and Communications Handbook John R. Vacca, 2019-07-05 This comprehensive handbook serves as a professional reference as well as a practitioner s guide to today s most complete and concise view of nanoscale networking and communications It offers in depth coverage of theory technology and practice as they relate to established technologies and recent advancements It explores practical solutions to a wide range of nanoscale networking and communications issues Individual chapters authored by leading experts in the field address the immediate and long term challenges in the authors respective areas of expertise

Single Molecule Sensing Beyond Fluorescence Warwick Bowen, Frank Vollmer, Reuven Gordon, 2022-03-01 This book provides an interesting snapshot of recent advances in the field of single molecule nanosensing The ability to sense single molecules and to precisely monitor and control their motion is crucial to build a microscopic understanding of key processes in nature from protein folding to chemical reactions Recently a range of new techniques have been developed that allow single molecule sensing and control without the use of fluorescent labels This volume provides an overview of recent advances that take advantage of micro and nanoscale sensing technologies and provide the prospect for rapid future progress The book endeavors to provide basic introductions to key techniques

recent research highlights and an outlook on big challenges in the field and where it will go in future It is a valuable contribution to the field of single molecule nanosensing and it will be of great interest to graduates and researchers working in this topic

Editors' Showcase: Nanotechnology Jan M. Macak, Nicolae Coriolan Panoiu, John Fourkas, Giancarlo Franzese, Wee-Jun Ong, 2024-06-18 We are pleased to present the latest Editors Showcase Nanotechnology Research Topic This exclusive article collection is led by Specialty Chief Editors Professors Jan Mac k Giancarlo Franzese Nicolae Coriolan Panoiu John Fourkas and Wee Jun Ong and submissions are open to Editorial Board members only The work presented here celebrates the quality and diversity of research performed by our Associate and Review Editors across the entire breadth of the Nanotechnology field and may include the latest discoveries current challenges and future forward reviews and perspectives

Sensing Leonard Dobrzyński, Housni Al-Wahsh, Abdellatif Akjouj, Abdelkrim Talbi, Eman A. Abdel-Ghaffar, Madiha Amrani, El Houssaine El Boudouti, 2026-02-27 *Sensing Long Lived Resonances* investigates and provides a solid understanding of long lived resonance sensing illustrated by simple examples Each chapter introduces and defines the sensing resonances their localized paths and applications Many examples in the book apply these methods to materials and sensing systems The ultimate aim of the book is to pave the way for the creation and improvement of sensors and devices for telecommunications and applied natural sciences The different examples presented within each chapter of this book can help close the gaps in communication between physicists and specialists using sensor results within their practices Offers a unique approach on sensing using long lived resonances from an interfacial transmission point of view Provides tutorial examples to aid in the design of new materials and devices for telecommunications applications Authored by world leading experts on interface transmission

Nanophotonics and Plasmonics Dr. Ching Eng (Jason) Png, Dr. Yuriy Akimov, 2017-08-21 This book provides a first integrated view of nanophotonics and plasmonics covering the use of dielectric semiconductor and metal nanostructures to manipulate light at the nanometer scale The presentation highlights similarities and advantages and shows the common underlying physics targets and methodologies used for different materials optically transparent materials for nanophotonics vs opaque materials for plasmonics Ultimately the goal is to provide a basis for developing a unified platform for both fields In addition to the fundamentals and detailed theoretical background the book showcases the main device applications Ching Eng Jason Png is Director of the Electronics and Photonics Department at the Institute of High Performance Computing Agency for Science Technology and Research Singapore Yuriy A Akimov is a scientist in the Electronics and Photonics Department at the Institute of High Performance Computing Agency for Science Technology and Research Singapore

Nanophotonics Hongxing Xu, 2017-11-09 The manipulation of light at the nanometer scale is highly pursued for both fundamental sciences and wide applications The diffraction limit of light sets the limit for the smallest size of photonic devices to the scale of light wavelength Fortunately the peculiar properties of surface plasmons in metal nanostructures make it possible to squeeze light into nanoscale volumes and enable the manipulation of

light and light matter interactions beyond the diffraction limit Studies on surface plasmons have led to the creation of a booming research field called plasmonics Because of its various scientific and practical applications plasmonics attracts researchers from different fields making it a truly interdisciplinary subject Nanophotonics Manipulating Light with Plasmons starts with the general physics of surface plasmons and a brief introduction to the most prominent research topics followed by a discussion of computational techniques for light scattering by small particles Then a few special topics are highlighted including surface-enhanced Raman scattering optical nanoantennas optical forces plasmonic waveguides and circuits and gain-assisted plasmon resonances and propagation The book discusses the fundamental and representative properties of both localized surface plasmons and propagating surface plasmons It explains various phenomena and mechanisms using elegant model systems with well-defined structures is illustrated throughout with excellent figures and contains an extensive list of references at the end of each chapter It will help graduate-level students and researchers in nanophotonics physics chemistry materials science nanoscience and nanotechnology and electrical and electronic engineering get a quick introduction to this field

Computational Nanophotonics Sarhan Musa, 2018-10-08 This reference offers tools for engineers scientists biologists and others working with the computational techniques of nanophotonics It introduces the key concepts of computational methods in a manner that is easily digestible for newcomers to the field The book also examines future applications of nanophotonics in the technical industry and covers new developments and interdisciplinary research in engineering science and medicine It provides an overview of the key computational nanophotonics and describes the technologies with an emphasis on how they work and their key benefits

Surface Plasmon Nanophotonics Mark L. Brongersma, Pieter G. Kik, 2007-09-18 This book discusses a new class of photonic devices known as surface plasmon nanophotonic structures The book highlights several exciting new discoveries while providing a clear discussion of the underlying physics the nanofabrication issues and the materials considerations involved in designing plasmonic devices with new functionality Chapters written by the leaders in the field of plasmonics provide a solid background to each topic

Nanophotonics and Plasmonics Ching Eng Png, Yuriy Akimov, 2017 This book provides a first integrated view of nanophotonics and plasmonics covering the use of dielectric semiconductor and metal nanostructures to manipulate light at the nanometer scale The presentation highlights similarities and advantages and shows the common underlying physics targets and methodologies used for different materials optically transparent materials for nanophotonics vs opaque materials for plasmonics Ultimately the goal is to provide a basis for developing a unified platform for both fields In addition to the fundamentals and detailed theoretical background the book showcases the main device applications Ching Eng Jason Png is Director of the Electronics and Photonics Department at the Institute of High Performance Computing Agency for Science Technology and Research Singapore Yuriy A Akimov is a scientist in the Electronics and Photonics Department at the Institute of High Performance Computing Agency for Science Technology and Research Singapore Provided by publisher

Nanophotonics Arthur McGurn, 2018-04-27 This book gives a readable introduction to the important rapidly developing field of nanophotonics. It provides a quick understanding of the basic elements of the field, allowing students and newcomers to progress rapidly to the frontiers of their interests. Topics include: The basic mathematical techniques needed for the study of the materials of nanophotonic technology; photonic crystals and their applications as laser resonators, waveguides, and circuits of waveguides; the application of photonic crystal technology in the design of optical diodes and transistors; the basic properties needed for the design and understanding of new types of engineered materials known as metamaterials; and a consideration of how and why these engineered materials have been formulated in the lab, as well as their applications as negative refractive index materials, as perfect lenses, as cloaking devices, and their effects on Cherenkov and other types of radiation. Additionally, the book introduces the new field of plasmonics and reviews its important features. The role of plasmon polaritons in the scattering and transmission of light by rough surfaces and the enhanced transmission of light by plasmon polariton supporting surfaces is addressed. The important problems of subwavelength resolution are treated with discussions of applications in a number of scientific fields. The basic principles of near field optical microscopy are presented with a number of important applications. The basics of atomic cavity physics, photonic entanglement, and its relation to some of the basic properties of quantum computing and the physics associated with the study of optical lattices are presented.

Principles of Nanophotonics Motoichi Ohtsu, Kiyoshi Kobayashi, Tadashi Kawazoe, Takashi Yatsui, Makoto Naruse, 2008-06-06 Coauthored by the developer of nanophotonics, this book outlines physically intuitive concepts of the subject using a novel theoretical framework that differs from conventional wave optics. After reviewing the background history and current status of research and development in nanophotonics and related technologies, the authors present a unique theoretical model to describe the interactions among nanometric material systems via optical near fields. They then explore nanophotonic devices and fabrication techniques and provide examples of qualitative innovation. The final chapter looks at how the assembly of nanophotonic devices produces a nanophotonic system. Integrated Nanophotonic Devices Zeev Zalevsky, Ibrahim Abdulhalim, 2014-06-18 Nanophotonics is a newly developing and exciting field with two main areas of interest: imaging, computer vision, and data transport. The technologies developed in the field of nanophotonics have far-reaching implications with a wide range of potential applications, from faster computing power to medical applications and smart eyeglasses to national security. Integrated Nanophotonic Devices explores one of the key technologies emerging within nanophotonics: that of nano-integrated photonic modulation devices and sensors. The authors introduce the scientific principles of these devices and provide a practical, applications-based approach to recent developments in the design, fabrication, and experimentation of integrated photonic modulation circuits. For this second edition, all chapters have been expanded and updated to reflect this rapidly advancing field, and an entirely new chapter has been added to cover liquid crystals integrated with nanostructures. Unlocks the technologies that will turn the rapidly growing research area of

nanophotonics into a major area of commercial development with applications in telecommunications computing security and sensing Nano integrated photonic modulation devices and sensors are the components that will see nanophotonics moving out of the lab into a new generation of products and services By covering the scientific fundamentals alongside technological applications the authors open up this important multidisciplinary subject to readers from a range of scientific backgrounds

Collective Plasmon-Modes in Gain Media V.A.G. Rivera,O.B. Silva,Y. Ledemi,Y. Messaddeq,E. Marega Jr.,2014-09-03

This book represents the first detailed description including both theoretical aspects and experimental methods of the interaction of rare earth ions with surface plasmon polariton from the point of view of collective plasmon photon interactions via resonance modes metal nanoparticles or nanostructure arrays with quantum emitters rare earth ions These interactions are of particular interest for applications to optical telecommunications optical displays and laser solid state technologies Thus our main goal is to give a more precise overview of the rapidly emerging field of nanophotonics by means of the study of the quantum properties of light interaction with matter at the nanoscale In this way collective plasmon modes in a gain medium result from the interaction coupling between a quantum emitter created by rare earth ions with a metallic surface inducing different effects such as the polarization of the metal electrons so called surface plasmon polariton SPP a field enhancement sustained by resonance coupling or transfer of energy due to non resonant coupling between the metallic nanostructure and the optically active surrounding medium These effects counteract the absorption losses in the metal to enhance luminescence properties or even to control the polarization and phase of quantum emitters The engineering of plasmons SPP in gain media constitutes a new field in nanophotonics science with a tremendous technological potential in integrated optics photonics at the nanoscale based on the control of quantum effects This book will be an essential tool for scientists engineers and graduate and undergraduate students interested not only in a new frontier of fundamental physics but also in the realization of nanophotonic devices for optical telecommunication Plasmonics and Light-Matter

Interactions in Two-Dimensional Materials and in Metal Nanostructures Paulo André Dias Gonçalves,2020-03-19 This thesis presents a comprehensive theoretical description of classical and quantum aspects of plasmonics in three and two dimensions and also in transdimensional systems containing elements with different dimensionalities It focuses on the theoretical understanding of the salient features of plasmons in nanosystems as well as on the multifaceted aspects of plasmon enhanced light matter interactions at the nanometer scale Special emphasis is given to the modeling of nonclassical behavior across the transition regime bridging the classical and the quantum domains The research presented in this dissertation provides useful tools for understanding surface plasmons in various two and three dimensional nanostructures as well as quantum mechanical effects in their response and their joint impact on light matter interactions at the extreme nanoscale These contributions constitute novel and solid advancements in the research field of plasmonics and nanophotonics that will help guide future experimental investigations in the blossoming field of nanophotonics and also

facilitate the design of the next generation of truly nanoscale nanophotonic devices

The book delves into Nano Photonics And Plasmonics In Comsol Multiphysics. Nano Photonics And Plasmonics In Comsol Multiphysics is a vital topic that must be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Nano Photonics And Plasmonics In Comsol Multiphysics, encompassing both the fundamentals and more intricate discussions.

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 6. In chapter 5, the author will draw a conclusion about Nano Photonics And Plasmonics In Comsol Multiphysics. This chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Nano Photonics And Plasmonics In Comsol Multiphysics.

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