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Different plasmonic waveguide structures have been proposed, such as layered structures, metallic nanowires, metallic nanoparticle arrays, hybrid wedge plasmonic waveguides, and other configurations. Here, a typical plasmonic waveguide consisting of a thin film sandwiched between a cladding cover and a substrate will be considered.

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Waveguide Using COMSOL Multiphysics F. Frezza1, P. Nocito2, and E. Stoja1 1Dept. of Information Engineering, Electronics and Telecommunications Sapienza University of Rome, Rome, Italy 2Communication Department, Istituto Superiore per le Comunicazioni Ministry of Economic Development, Rome, Italy COMSOL Conference 2011 Stuttgart. Outline Introduction Plasmonic Slot Waveguide Mode Properties ...

Modal Characterization of the Plasmonic Slot Waveguide ...
Plasmonic Waveguide Filter Application ID: 60001 This example of a plasmonic waveguide filter shows that the waveguide rejects the electromagnetic radiation of the wavelength between 1.4 um and 1.6 um, but allows the rest of the wavelength.

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Perpendicular waves of RF module- mode analysis PML boundary condition A core region with a rectangular array of four air holes (to provide the birefringence) A conventional circular-air-hole cladding (to reduce the confinement loss).

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mode analysis of a waveguide - COMSOL
Plasmonic Waveguide Analysis K. C. Koppenhoefer 1, S. Yushanov1, J. S. Crompton1 1AltaSim Technologies, Columbus, OH, USA Abstract Surface Plasmons (SP) or Surface Plasmon Polaritons (SPP) are electromagnetic excitations that propagate at the interface between a dielectric and a conductor, and are evanescently confined in the perpendicular direction to the propagation. They arise via coupling ...

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LiNbO 3 -based device comprises of a photonic probe module, light coupling module and a photo detector. LiNbO 3 is deposited using pulsed laser deposition system, on a silicon substrate. The waveguide / Interferometer structure is further patterned using conventional photolithography.

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Plasmonic Waveguide Filter Application ID: 60001 This example of a plasmonic waveguide filter shows that the waveguide rejects the electromagnetic radiation of the wavelength between 1.4 um and 1.6 um, but allows the rest of the wavelength.

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Model a plasmonic waveguide filter in the COMSOL Multiphysics® software. This example includes a downloadable MPH-file and accompanying tutorial blog post.

Plasmonics is entering the curriculum of many universities, either as a stand alone subject, or as part of some course or courses. Nanotechnology institutes have been, and are being, established in universities, in which plasmonics is a significant topic of research. Modern Plasmonics book offers a comprehensive presentation of the properties of surface plasmon polaritons, in systems of different structures and various natures, e.g. active, nonlinear, graded, theoretical/computational and experimental techniques for studying them, and their use in a variety of applications. Contains material not found in existing books on plasmonics, including basic properties of these surface waves, theoretical/computational and experimental approaches, and new applications of them. Each chapter is written by an expert in the subject to which it is devoted. Emphasis on applications of plasmonics that have been realized, not just predicted or proposed.

This book is a compendium of the finest research in nanoplasmonic sensing done around the world in the last decade. It describes basic theoretical considerations of nanoplasmons in the dielectric environment, gives examples of the multitude of applications of nanoplasmonics in biomedical and chemical sensing, and provides an overview of future trends in optical and non-optical nanoplasmonic sensing. Specifically, readers are guided through both the fundamentals and the latest research in the two major fields nanoplasmonic sensing is applied to – bio- and chemo-sensing – then given the state-of-the-art recipes used in nanoplasmonic sensing research.

This pictorial manuscript is a step-by-step graphical illustrations for waveguides and devices modeling and computational physics simulation using COMSOL Multiphysics with Ray Optics, Wave Optics and AC/DC Electrostatics modules. All the example models investigated and visualized with the help of Finite Element Analysis are referenced from the standard USA undergraduate text on Optical Guided Waves and Devices by Richard Syms and John Cozens. The simulations include the use of geometrical ray tracings for point source and full electromagnetic waves source employing the Maxwell's wave equations for plane wave input. Both 2D and 3D simulation results will help in visualize the electromagnetic field propagating inside the waveguides and devices. Readers without fundamental handle on optics modeling are suggested to read the Optics Modeling and Visualization with COMSOL Multiphysics: A step by step graphical instruction manuscripts for detailed discussion. These models may be expanded to post-graduate research and industrial photonics waveguides and devices development. There are 46 chapters of different 2D and 3D optical waveguides & devices structures modeled and simulated in Volume 1 and 2. Volume 1 models include 3D single mode optical fiber, planar waveguide, channel waveguide, longitudinal and transverse phase modulator, surface plasmon, optical square waveguide, tapered waveguide, FTIR beamsplitter in ray tracing and electromagnetic wave solvers, full prism coupler, halved prism coupler, plano convex overlay lens, overlay Luneburg lens, geodesic lens with control setup for resulted electric field comparison, corrugated gratings, transmission and reflection gratings, chirped grating lens, beam expander grating, grating coupler, chirped grating coupler, buried channel waveguide. Volume 2 models continue with the ridge channel waveguide, strip loaded channel waveguide, GaAs GaAlAs planar waveguide, GaAs GaAlAs heterostructure waveguide, radiation leaks at fiber bend, radiation leaks at waveguide bend, c-axis Calcite polarizer waveguide, integrated optic normal reflector, horn channel waveguide, Y-Junction waveguide, optical phase modulator, cut off modulator, electro optic Mach-Zehnder interferometer waveguide, parallel coupling waveguide, electro optic directional coupler, single polished fiber directional coupler, double polished fiber directional coupler, tunable-coupling strength of polished double fiber coupler, cross sectional coaxial fiber coupler, 2D directional coupler with tapered coupling, corrugated reflection gratings, optical fiber grating on half polished fiber coupler, and track-changing reflector with grating assisted-coupling fiber.

This pictorial manuscript is a step-by-step graphical illustrations for waveguides and devices modeling and computational physics simulation using COMSOL Multiphysics with Ray Optics, Wave Optics and AC/DC Electrostatics modules. All the example models investigated and visualized with the help of Finite Element Analysis are referenced from the standard USA undergraduate text on Optical Guided Waves and Devices by Richard Syms and John Cozens. The simulations include the use of geometrical ray tracings for point source and full electromagnetic waves source employing the Maxwell's wave equations for plane wave input. Both 2D and 3D simulation results will help in visualize the electromagnetic field propagating inside the waveguides and devices. Readers without fundamental handle on optics modeling are suggested to read the Optics Modeling and Visualization with COMSOL Multiphysics: A step by step graphical instruction manuscripts for detailed discussion. These models may be expanded to post-graduate research and industrial photonics waveguides and devices development. There are 46 chapters of different 2D and 3D optical waveguides & devices structures modeled and simulated in Volume 1 and 2. Volume 1 models include 3D single mode optical fiber, planar waveguide, channel waveguide, longitudinal and transverse phase modulator, surface plasmon, optical square waveguide, tapered waveguide, FTIR beamsplitter in ray tracing and electromagnetic wave solvers, full prism coupler, halved prism coupler, plano convex overlay lens, overlay Luneburg lens, geodesic lens with control setup for resulted electric field comparison, corrugated gratings, transmission and reflection gratings, chirped grating lens, beam expander grating, grating coupler, chirped grating coupler, buried channel waveguide. Volume 2 models continue with the ridge channel waveguide, strip loaded channel waveguide, GaAs GaAlAs planar waveguide, GaAs GaAlAs heterostructure waveguide, radiation leaks at fiber bend, radiation leaks at waveguide bend, c-axis Calcite polarizer waveguide, integrated optic normal reflector, horn channel waveguide, Y-Junction waveguide, optical phase modulator, cut off modulator, electro optic Mach-Zehnder interferometer waveguide, parallel coupling waveguide, electro optic directional coupler, single polished fiber directional coupler, double polished fiber directional coupler, tunable-coupling strength of polished double fiber coupler, cross sectional coaxial fiber coupler, 2D directional coupler with tapered coupling, corrugated reflection gratings, optical fiber grating on half polished fiber coupler, and track-changing reflector with grating assisted-coupling fiber.

Metamaterials and plasmonics are cross-disciplinary fields that are emerging into the mainstream of many scientific areas. Examples of scientific and technical fields which are concerned are electrical engineering, micro- and nanotechnology, microwave engineering, optics, optoelectronics, and semiconductor technologies. In plasmonics, the interplay between propagating electromagnetic waves and free-electron oscillations in materials are exploited to create new components and applications. On the other hand, metamaterials refer to artificial composites in which small artificial elements, through their collective interaction, creates a desired and unexpected macroscopic response function that is not present in the constituent materials. This book charts the state of the art of these fields. In May 2008, world-leading experts in metamaterials and plasmonics gathered into a NATO Advanced Research Workshop in Marrakech, Morocco. The present book contains extended versions of 22 of the presentations held in the workshop, covering the general aspects of the field, as well as design and modelling questions of plasmonics and metamaterials, fabrication issues, and applications like absorbers and antennas.

Plasmonic resonators, composed of metallic micro- and nanostructures, belong to the category of excited-state physics on resonances from gigahertz to petahertz. Dynamical physics is in contrast to ground-state physics, which includes thermal states, and is connected to diverse applications to enhance existing photo-induced effects and phenomena such as plasmon-enhanced photoluminescence and Raman scattering. This book has three main aims: to provide fundamental knowledge on plasmonic resonators, to explain diverse plasmonic resonators, and to stimulate further development in plasmonic resonators. Plasmon-related studies, which are sometimes called plasmonics and include a substantial portion of metamaterials, have shown significant development since the 1980s. The piled-up results are too numerous to study from the beginning, but this book summarizes those results, including the history (past), all the possible types of plasmonic resonators (present), and their wide range of applications (future). It provides the basics of plasmons and resonant physics for undergraduate students, the systematic knowledge on plasmonic resonators for graduate students, and cutting-edge and in-depth information on plasmon-enhancement studies for researchers who are not experts in plasmonics and metamaterials, thereby benefitting a wide range of readers who are interested in the nanotechnology involving metallic nanostructures.

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

This book provides the fundamental understanding of the functioning of solar cellsand the materials for the effective utilization of energy resources. The main objective of writing this book is to create a comprehensive and easy-to-understand source of information on the advances in the rapidly growing research on solar cells. Emerging Solar Energy Materials comprises 12 chapters written by the experts in the solar cell field and is organized with the intention to provide a big picture of the latest progress in the solar cell field and at the same time give an in-depth discussion on fundamentals of solar cells for interested audiences. In this book, each part opens with a new author's essay highlighting their work for contribution toward solar energy. Critical, cutting-edge subjects are addressed, including: Photovoltaic device technology and energy applications; Functional solar energy materials; New concept in solar energy; Perovskite solar cells; Dye-sensitized solar cells; Organic solar cells; Thin-film solar cells. The book is written for a large and broad readership including researchers and university graduate students from diverse backgrounds such as chemistry, physics, materials science, and photovoltaic device technology. The book includes enough information on the basics to be used as a textbook undergraduate coursework in engineering and the sciences.

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.

This book is meant as an introduction to graphene plasmonics and aims at the advanced undergraduate and graduate students entering the field of plasmonics in graphene. In it different theoretical methods are introduced, starting with an elementary description of graphene plasmonics and evolving towards more advanced topics. This book is essentially self-contained and brings together a number of different topics about the field that are scattered in the vast literature. The text is composed of eleven chapters and of a set of detailed appendices. It can be read in two different ways: Reading only the chapters to get acquainted with the field of plasmonics in graphene or reading the chapters and studying the appendices to get a working knowledge of the topic. The study of the material in this book will bring the students to the forefront of the research in this field. Errata(s) Errata (159 KB) Contents: IntroductionElectromagnetic Properties of Solids in a NutshellSurface Plasmon–Polaritons at Dielectric–Metal InterfacesGraphene Surface PlasmonsExcitation of Graphene Surface PlasmonsLaunching Plasmons Using a Metallic AntennaPlasmonics in Periodic Arrays of Graphene RibbonsPlasmons in Graphene Nanostructures and in One-dimensional ChannelsExcitation of Surface Plasmon–Polaritons Using Dielectric GratingsExcitation of Plasmons by an Emitting DipoleConcluding Remarks Readership: Advanced undergraduate and graduate students entering the field of graphene plasmonics.