

An Introduction To Metamaterials And Waves In Composites

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Metamaterials and Metasurfaces
Metamaterials Oxford Handbook of Nanoscience and Technology
Metamaterials in Topological Acoustics
Optical Metamaterials
Metamaterials with Negative Parameters
Electromagnetic Metasurfaces
Optical Properties of Advanced Materials
Advanced Materials Researches, Engineering and Manufacturing Technologies in Industry
Metamaterials and Metasurfaces
Nanotechnology-Based Additive Manufacturing
Material and Manufacturing Technology V
Metamaterials
Materials and Applications for Sensors and Transducers
Multifunctional Antennas and Arrays for Wireless Communication Systems
Materials, Manufacturing Engineering and Information Technology
Advanced Materials and Engineering Materials IV
Metamaterials II
An Introduction to Metamaterials and Waves in Composites
Constantin Simovski Mohammad Rashed Iqbal Faruque Nader Engheta A. V. Narlikar Sourav Banerjee Wenshan Cai Ricardo Marqués Karim Achouri Yoshinobu Aoyagi Hong Hua Tan Subal Kar Kalim Deshmukh Mei Xing Guo Nader Engheta Evangelos Hristoforou Satish K. Sharma B. Xu Katsuyuki Kida Vladimír Kuzmiak Biswajit Banerjee

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this book offers a unified presentation of metamaterials building from fundamental nanophotonic principles

metamaterial is an artificially constructed material that interacts differently with light and sound waves than standard natural materials the book gives a comprehensive overview of metamaterials and their properties and the most prevalent structural designs for microwave and terahertz frequencies the authors introduce new coding metamaterial for specific absorption rate sar reduction applications in 5g cellular networks they present conventional metamaterial with unique properties ultra thin wide band and μ negative mng characteristics for terahertz frequency application the authors explore radiation protection spanning fundamental concepts to the latest technologies critically analyze how metamaterials contribute to the enhancement of safety and precision in radiation therapy they cover metamaterial absorbers navigate the domain of coding metamaterials emphasizing their distinctive properties and pivotal role in rcs reduction and emi shielding

leading experts explore the exotic properties and exciting applications of electromagnetic metamaterials metamaterials physics and engineering explorations gives readers a clearly written richly illustrated introduction to the most recent research developments in the area of electromagnetic metamaterials it explores the fundamental physics the designs and the engineering aspects and points to a myriad of exciting potential applications the editors acknowledged leaders in the field of metamaterials have invited a group of leading researchers to present both their own findings and the full array of state of the art applications for antennas waveguides devices and components following a brief overview of the history of artificial materials the publication divides its coverage into two major classes of metamaterials the first half of the publication examines effective media with

single negative and double negative dielectric and magnetic properties the second half examines electromagnetic band gap structures the book further divides each of these classes into their three dimensional 3d volumetric and two dimensional 2d planar or surface realizations examples of each type of metamaterial are presented and their known and anticipated properties are reviewed collectively metamaterials physics and engineering explorations presents a review of recent research advances associated with a highly diverse set of electromagnetic metamaterials its multifaceted approach offers readers a combination of theoretical numerical and experimental perspectives for a better understanding of their behaviors and their potential applications in components devices and systems extensive reference lists provide opportunities to explore individual topics and classes of metamaterials in greater depth with full color illustrations throughout to clarify concepts and help visualize actual results this book provides a dynamic user friendly resource for students engineers physicists and other researchers in the areas of electromagnetic materials microwaves millimeter waves and optics it equips newcomers with a basic understanding of metamaterials and their potential applications advanced researchers will benefit from thought provoking perspectives that will deepen their knowledge and lead them to new areas of investigation

these three volumes are intended to shape the field of nanoscience and technology and will serve as an essential point of reference for cutting edge research in the field

as an equivalent counterpart of topological research on photonics and condensed matter physics acoustic metamaterials create an opportunity to explore the topological behaviors in phononics and physics of programmable acoustics this book introduces the topological behavior of acoustics through the novel design of metamaterials it provides valuable insight into acoustic metamaterials from multidisciplinary fundamentals to cutting edge research serves as a single resource on acoustic metamaterials covers the fundamentals of classical mechanics quantum mechanics and state of the art condensed matter physics principles so that topological acoustics can be easily understood by engineers introduces topological behaviors with acoustics and elastic waves through quantum analogue hall effects quantum spin hall effects and quantum valley hall effects and their applications explains the pros and cons of different design methods and gives guidelines for selecting specific designs of acoustic metamaterials with specific topological behaviors includes matlab code for numerical analysis of band structures this book is written for graduate students researchers scientists and professionals across materials mechanical civil and aerospace engineering and those who want to enhance their understanding and commence research in metamaterials

metamaterials artificially structured materials with engineered electromagnetic properties have enabled unprecedented flexibility in manipulating electromagnetic waves and producing new functionalities this book details recent advances in the study of optical metamaterials ranging from fundamental aspects to up to date implementations in one unified treatment important recent developments and applications such as superlens and cloaking devices are also treated in detail and made understandable the planned monograph can serve as a very timely book for both newcomers and advanced researchers in this extremely rapid evolving field

the first general textbook to offer a complete overview of metamaterial theory and its microwave applications metamaterials with negative parameters represents the only unified treatment of metamaterials available in one convenient book devoted mainly to metamaterials that can be characterized by a negative effective permittivity and or permeability the book includes a wide overview of the most important topics scientific fundamentals and technical applications of metamaterials chapter coverage includes the electrodynamics of left handed media synthesis of bulk metamaterials synthesis of metamaterials in planar technology microwave applications of metamaterial concepts and advanced and related topics including surface resonant and complementary based admittance surfaces magneto and electro inductive waves and sub diffraction imaging devices a list of problems and references is included at the end of each chapter and a bibliography offers a complete up to date representation of the current state of the art in metamaterials geared toward students and professionals alike metamaterials with negative parameters is an ideal textbook for postgraduate courses and also serves as a valuable introductory reference for scientists and rf microwave engineers

discover a comprehensive exploration of recent developments and fundamental concepts

in the applications of metasurfaces in electromagnetic metasurfaces theory and applications distinguished researchers and authors karim achouri and christophe caloz deliver an introduction to the fundamentals and applications of metasurfaces and an insightful analysis of recent and future developments in the field the book describes the precursors and history of metasurfaces before continuing on to an exploration of the physical insights that can be gleaned from the material parameters of the metasurface you ll learn how to compute the fields scattered by a metasurface with known material parameters being illuminated by an arbitrary incident field as well as how to realize a practical metasurface and relate its material parameters to its physical structures the authors provide examples to illustrate all the concepts discussed in the book to improve and simplify reader understanding electromagnetic metasurfaces concludes with an incisive discussion of the likely future directions and research opportunities in the field readers will also benefit from the inclusion of a thorough introduction to metamaterials the concept of metasurfaces and metasurface precursors an exploration of electromagnetic modeling and theory including metasurfaces as zero thickness sheets and bianisotropic susceptibility tensors a practical discussion of susceptibility synthesis including four parameters synthesis more than four parameters synthesis and the addition of susceptibility components a concise treatment of scattered field analysis including approximate analytical methods and finite difference frequency domain techniques perfect for researchers in metamaterial sciences and engineers working with microwave thz and optical technologies electromagnetic metasurfaces theory and applications will also earn a place in the libraries of graduate and undergraduate students in physics and electrical engineering

in the last decade optically functionalized materials have developed rapidly from bulk matters to structured forms now we have a rich variety of attractive advanced materials they are applied to optical and electrical devices that support the information communication technology in the mid 21 th century accordingly it is quite important to have a broad knowledge of the optical properties of advanced materials for students scientists and engineers working in optics and related fields this book is designed to teach fundamental optical properties of such advanced materials effectively these materials have their own peculiarities which are very interesting in modern optical physics and also for applications because the concepts of optical properties are quite different from those in conventional optical materials hence each chapter starts to review the basic concepts of the materials briefly and proceeds to the practical use the important topics covered in this book include quantum structures of semiconductors spintronics photonic crystals surface plasmons in metallic nanostructures photonic metamaterials liquid crystal materials organic led materials and magnet optics

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this book explores the fundamental concepts applications and future trends of metamaterials and metasurfaces being a suitable text book for teaching at bachelors and masters level it is also helpful for researchers working in the field of meta research

nanotechnology based additive manufacturing state of the art overview of additive manufacturing techniques with an emphasis on processes product designs and applications this book offers a thorough overview of additive manufacturing technologies including manufacturing requirements product design optimization of processes and product parameters to reduce manufacturing costs it provides a comprehensive and state of the art review on various additive manufacturing technologies their advantages shortcomings potential applications and future directions sample topics discussed by the three well qualified editors on the topic of additive manufacturing include areas of application in the fields of electronics aerospace construction automobile sports and biomedicine material considerations the requirement of specific design fabrication and processing methods advantages and disadvantages of various 3d printing techniques for the respectively intended applications this book is an immensely valuable resource for researchers working in the field of additive manufacturing or 3d printing or for developers dealing with the processing and manufacturing of materials and products for advanced technologies

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modern metamaterials is relatively new less than two years old and evolving rapidly it has captured the interest of researchers because theoretically predicted exciting fundamental electromagnetic phenomena can now be realized experimentally and novel devices are feasible this is the critical resource sought by readers who need fundamental knowledge and applications provided by pre eminent experts in this field

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multifunctional antennas and arrays for wireless communication systems offers an up to date discussion of multifunctional antennas and arrays for wireless communication systems multifunctional antennas and arrays for wireless communication systems is a comprehensive reference on state of the art reconfigurable antennas and 4g 5g communication antennas the book gives a unique perspective while giving a comprehensive overview of the following topics frequency reconfigurable antennas pattern reconfigurable antennas polarization reconfigurable antennas reconfigurable antennas using liquid metal piezoelectric and rf mems mimo and 4g 5g wireless communication antennas metamaterials and metasurfaces in reconfigurable antennas multifunctional antennas for user equipments ues defense related antennas and applications flat panel phased array antennas the book is a valuable resource for the practicing engineer as well as for those within the research field as wireless communications continuously evolves more and more functionally will be required and thus multifunctional antennas and rf systems will be necessary these multifunctional antennas will require a degree of reconfigurability and this book discusses various methods which enable this the main topics of frequency pattern and polarization reconfigurability is first discussed methods utilizing unique materials and devices both real and artificial are discussed the book also delves into 4g 5g antennas as it relates to mimo and millimeter wave phased arrays finally there is a section on defense related multifunctional rf antenna systems

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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

requiring no advanced knowledge of wave propagation an introduction to metamaterials and waves in composites focuses on theoretical aspects of metamaterials periodic composites and layered composites the book gives novices a platform from which they can start exploring the subject in more detail after introducing concepts related to elasticity acoustics and electrodynamics in media the text presents plane wave solutions to the equations that describe elastic acoustic and electromagnetic waves it examines the plane wave expansion of sources as well as scattering from curved interfaces specifically spheres and cylinders the author then covers electrodynamic acoustic and elastodynamic metamaterials he also describes examples of transformations aspects of acoustic cloaking and applications of pentamode materials to acoustic cloaking with a focus on periodic composites the text uses the bloch floquet theorem to find the effective behavior of composites in the quasistatic limit presents the quasistatic equations of elastodynamic and electromagnetic waves and investigates brillouin zones and band gaps in periodic structures the final chapter discusses wave propagation in smoothly varying layered media anisotropic density of a periodic layered medium and quasistatic homogenization of laminates this book provides a launch pad for research into elastic and acoustic metamaterials many of the ideas presented have yet to be realized experimentally the book encourages readers to explore these ideas and bring them to technological maturity

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