Radar Absorbing Materials From Theory To Design And Characterization

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Electromagnetic Fields and Waves Springer Nature
This book gathers high-quality research papers presented at the First International Conference, ICSC 2019, organised by THDC Institute of Hydropower Engineering and Technology, Tehri, India, from 20 to 21 April 2019. The book is divided into two major sections – Intelligent Computing and Smart Communication. Some of the areas covered are Parallel and Distributed Systems, Web Services, Databases and Data Mining Applications, Feature Selection and Feature Extraction, High-Performance Data Mining Algorithms, Knowledge Discovery, Communication Protocols and Architectures, High-speed Communication, High-Voltage Insulation Technologies, Fault Detection and Protection, Power System Analysis, Embedded Systems, Architectures, Electronics in Renewable Energy, CAD for VLSI, Green Electronics, Signal and Image Processing, Pattern Recognition and Analysis, Multi-Resolution Analysis and Wavelets, 3D and Stereo Imaging, and Neural Networks.
Technical Abstract Bulletin Radar Absorbing Materials
The book focuses on electromagnetic absorbing and shielding properties of multilayer materials. Nanomaterials are widely used and composite materials' dielectric characterization is deeply discussed. Very little academic literature exists on how to model(design) an electromagnetic absorber using matrix formalism of microwave propagation through multilayer materials. This book therefore, provides an interesting approach to the absorber's design in which different branches of science are applied and where all of them are used to optimize the "quasi perfect absorber" nanotechnology, electromagnetic wave propagation theory, composite materials manufacturing, evolutionary computation. With respect to the present literature, the method presented in this book computes the absorbing capability of materials, taking into account for the reflection and transmission coefficients, considering also oblique incidence of the electromagnetic field. Theoretical modeling of absorbers is experimentally validated. At the end of the book the electromagnetic shielding performance of carbon-carbon material and of high weight percentage carbon nanotubes based composite materials are throughly analyzed.
Reflectivity and Transmissivity Through Layered, Lossy Media: A User-Friendly Approach Artech House
The theory behind the use of layers of radar absorbing materials or other dielectric materials is identical to the theory of optical reflection and transmission through layered media. This report is intended to be of use to students studying the application of layered media to a radar cross-section reduction problem. In this report, we survey several established optics and electromagnetics texts. We critique them and attempt to reconcile differences. We arrive at a single consistent theory which fully considers lossy materials. Layers are depicted as matrices which can be multiplied to combine the effects of several adjacent layers. We can then find the transmissivity and reflectivity of the entire multiple-layer structure. This theory is implemented in the MATLAB language in a user-friendly format.
Optimization of Multilayered Radar Absorbing Structures (Ras) Using Nature Inspired Algorithm Elsevier
Selected, peer reviewed papers from the 4th international Conference on Manufacturing Science and Engineering (ICMSE 2013), March 30-31, 2013, Dalian, China
New Pigments and Additives for Corrosion Protection by Organic Coatings Springer Nature
The compact range allows for the measurement of radar cross section and antenna patterns in a relatively small room. An offset-feed parabolic reflector is normally used to approximate a plane wave in the target zone; however, some of the energy transmitted by the feed will strike the ceiling, walls, and floor of the room. These stray signals then scatter in all directions. To reduce the level of scattered energy, the room is typically lined with pyramidal-shaped radar absorbing material. However, the behavior of this material is not well understood. A diffraction formulation, based on the Uniform Geometrical Theory of Diffraction is developed for a lossy dielectric corner. Using this formulation, a computer code is written that calculates the bistatic scattering from a pyramidal absorber tip. Sample results display some features of scattering from a single pyramid. Calculations are then compared with backscatter measurements of a single pyramid, and with bistatic measurements of an absorber wall. Next, a general purpose computer code is written which calculates the scattering into the target zone of a compact range from the pyramidal absorber which lines the room. Sample calculations show the total power scattered into the target zone, and how strongly various locations in the room contribute to this total scattered power. Theses.
Electromagnetic Nanomaterials BoD – Books on Demand
This book highlights essential concepts in connection with the traditional bat algorithm and its recent variants, as well as its application to find optimal solutions for a variety of real-world engineering and medical problems. Today, swarm intelligence-based meta-heuristic algorithms are extensively being used to address a wide range of real-world optimization problems due to their adaptability and robustness. Developed in 2009, the bat algorithm (BA) is one of the most successful swarm intelligence procedures, and has been used to tackle optimization tasks for more than a decade. The BA's mathematical model is quite straightforward and easy to understand and enhance, compared to other swarm approaches. Hence, it has attracted the attention of researchers who are working to find optimal solutions in a diverse range of domains, such as N-dimensional numerical optimization, constrained/unconstrained optimization and linear/nonlinear optimization problems. Along with the traditional BA, its enhanced versions are now also being used to solve optimization problems in science, engineering and medical applications around the globe.
Electromagnetic Wave Scattering by Aerial and Ground Radar Objects John Wiley & Sons
Radar absorbing materials offers an electromagnetic (EM) perspective to the evolution of radar absorbing materials (RAM). The major aspects covered are the EM analysis, design, fabrication and characterization of RAM. This is followed by an exhaustive discussion on the application areas and current trends in RAM. All the major aspects of RAM technology are covered in this book. The analytical techniques are developed from first principles. [source : 4e de couv.]
Fact Book CRC Press
ELECTROMAGNETIC METAMATERIALS The book presents an overview of metamaterials current state of development in several domains of application such as electromagnetics, electrical engineering, classical optics, microwave and antenna engineering, solid-state physics, materials sciences, and optoelectronics. Metamaterials have become a hot topic in the scientific community in recent years due to their remarkable electromagnetic properties. Metamaterials have the ability to alter electromagnetic and acoustic waves in ways that bulk materials cannot. Electromagnetic Metamaterials: Properties and Applications discusses a wide range of components to make metamaterial-engineered devices. It gives an overview of metamaterials' current stage of development in a variety of fields such as remote aerospace applications, medical appliances, sensor detectors and monitoring devices of infrastructure, crowd handling, smart solar panels, radomes, high-gain antennas lens, high-frequency communication on the battlefield, ultrasonic detectors, and structures to shield from earthquakes. Audience Researchers and engineers in electromagnetic and electrical engineering, classical optics, microwave and antenna engineering, solid-state physics, materials sciences, and optoelectronics.
Nondestructive Evaluation of Layered Materials Using the E-pulse Technique Springer
Radar Absorbing MaterialsSpringer
Handbook of Electromagnetic Materials Springer
Methods of Radar Cross-section Analysis
Handbook of Dielectric and Thermal Properties of Materials at Microwave Frequencies CRC Press
In this book, a variety of topics related to electromagnetic fields

and waves are extensively discussed. The topics encompass the physics of electromagnetic waves, their interactions with different kinds of media, and their applications and effects.
Symposia Frontiers Media SA
This book focuses on the role of soft-computing-based electromagnetic computational engines in design and optimization of a wide range of electromagnetic applications. In addition to the theoretical background of metamaterials and soft-computing techniques, the book discusses novel electromagnetic applications such as tensor analysis for invisibility cloaking, metamaterial structures for cloaking applications, broadband radar absorbers, and antennas. The book will prove to be a valuable resource for academics and professionals, as well as military researchers working in the area of metamaterials.
The NASA Scientific and Technical Information System SciTech Publishing
The leading text and reference on radar cross section (RCS) theory and applications, this work presents a comparison of two radar signal strengths. One is the strength of the radar bean sweeping over a target, the other is the strength of the reflected echo senses by the receiver. This book shows how the RCS "gauge" can be predicted for theoretical objects.
Genetic Algorithms in Electromagnetics CRC Press
There has been a long-standing interest in the development of radar absorbing materials (RAMs) for military applications such as microwave absorbers for stealth technology, anechoic chambers, and morphing scenarios, as well as camouflaging ground-based hardware against airborne radar observation. Even so, there remain outstanding challenges in this area such as the selection of suitable material compositions, the available frequency bandwidth, and the required thickness of the materials. The properties of materials at the nano-scale can change significantly. With only a reduction in size (no change in the substance itself), materials can exhibit new properties such as electrical conductivity, insulating behavior, and greater reactivity, characteristics that the same substance does not display at the micro/macro-scale. In addition, interactions at the interfaces of phases improve substantially when the dimensions reach the nanometer dimensions. That is very important to enhance material properties. Composite materials are multi-phased compositions of two or more components, which obtain new characteristic properties. They usually consist of a certain host matrix containing one or more fillers, which can be made up of nanoparticles/fibers. Many efforts by researchers have been made in recent years using novel nanoscience improvements in order to get nanostructured materials with enhanced performance. In this work, we investigate several approaches to design nano-structured composite materials, which would behave as suitable absorbers for normally indcident electromagnetic plane waves, and to enhance these properties consistent with the radar frequency bands. The thesis provides a useful sample of contemporary research activities in this field. It includes the related theory, fabrication, and characterization of various type of nanocomposites.
The NASA Scientific and Technical Information System: Its Scope and Coverage Springer Science & Business Media
The NATO Advanced Research Workshop Bianisotropics 2002 was held in th Marrakesh, Morocco, during 8-11 May 2002. This was the 9 International Conference on Electromagnetics of Complex Media, belonging to a series of meetings where the focus is on electromagnetics of chiral, bianisotropic, and other materials that may respond to electric and magnetic field excitations in special manner. The first of these meetings was held in Espoo, Finland (1993), and the following venues were Gomel, Belarus (1993), Perigueux, France (1994), State College, Pennsylvania, USA (1995), the rivers and channels between St. Petersburg and Moscow in Russia (1996), Glasgow, Scotland (1997), Brunswick, Germany (1998), and Lisbon, Portugal (2000). The present book contains full articles of several of the presentations that were given in the Marrakesh conference. In Bianisotropics 2002, 8 re view lectures, 14 invited lectures and 68 contributed talks and posters were presented. Of these presentations, after a double review process, 28 contributions have achieved their final form on the pages to follow. From the contributions ofthe meeting, also another publication is being planned: a Special Issue of the journal Electromagnetics will be devoted to complex materials. Guest editors for this issue are Keith W. Whites and Said Zouhdi. The chairmen of Bianisotropics 2002conference were Said Zouhdi (Pierre et Marie Curie University - Paris) and Mohamed Arsalane (Cadi Ayyad University - Marrakesh), who were assisted by Scientists from Moroccan Universities and the International Bianisotropics Conference Committee.
Defense Technical Information Center Thesaurus LAP Lambert Academic Publishing
Due to its extensive applications in stealth technology, much of the research effort in radar absorbing materials (RAM) has remained classified. As is the wont with classified topics, it has resulted in much awe and unfounded speculation. The aim of this book is to demystify this topic. The book in hand is concise but complete in itself. The attention of the readers is first drawn towards the historical evolution of RAM to emphasize that the elementary principles of electromagnetics lead to the fundamental concepts of RAM. These also form the basis for further mathematical analysis and design of RAM. The performance plots for the various RAM designs, to the extent possible, are taken with respect to power reflection; this should facilitate comparison of their relative performances. In order to further induce the reader to take the first step towards RAM design, we have included the relevant computer codes in a companion diskette. This would enable the reader to try out elementary designs on his own. * .EXE files should facilitate ready execution of codes on most DOS based computing platforms. The corresponding source codes with comments are also included as * .FOR files. The reader may wish to modify some of these codes for examining RAM design algorithms further. We welcome comments from the reader on these codes.
Development of Radar Absorbing Materials (rams) Based on Nano-structured Magnetic Materials and Applications CRC Press
A thorough and insightful introduction to using genetic algorithms to optimize electromagnetic systems Genetic Algorithms in Electromagnetics focuses on optimizing the objective function when a computer algorithm, analytical model, or experimental result describes the performance of an electromagnetic system. It offers expert guidance to optimizing electromagnetic systems using genetic algorithms (GA), which have proven to be tenacious in finding optimal results where traditional techniques fail. Genetic Algorithms in Electromagnetics begins with an introduction to optimization and several commonly used numerical optimization routines, and goes on to feature: Introductions to GA in both binary and continuous variable forms, complete with examples of MATLAB(r) commands Two step-by-step examples of optimizing antenna arrays as well as a comprehensive overview of applications of GA to antenna array design problems Coverage of GA as an adaptive algorithm, including adaptive and smart arrays as well as adaptive reflectors and crossed dipoles Explanations of the optimization of several different wire antennas, starting with the famous "crooked monopole" How to optimize horn, reflector, and microstrip patch antennas, which require significantly more computing power than wire antennas Coverage of GA optimization of scattering, including scattering from frequency selective surfaces and electromagnetic band gap materials Ideas on operator and parameter selection for a GA Detailed explanations of particle swarm optimization and multiple objective optimization An appendix of MATLAB code for experimentation
The Minimization of the Radar Cross Section of a Cylinder by Central Loading Springer
The application of microwave energy for thermal processing of different materials and substances is a rapidly growing trend in modern science and engineering. In fact, optimal design work involving microwaves is impossible without solid knowledge of the properties of these materials. Here's a practical reference that collects essential data on the dielectric and thermal properties of microwaveable materials, saving you countless hours on projects in a wide range of areas, including microwave design and heating, applied electrodynamics, food science, and medical technology. This unique book provides hard-to-find information on complex dielectric permittivity of media at industrial, scientific, and medical frequencies (430 MHz, 915MHz, 2.45GHz, 5.8 GHz, and 24.125GHz). Written by a leading expert in the field, this authoritative book does an exceptional job at presenting critical data on various materials and explaining what their key characteristics are concerning microwaves.
Scientific and Technical Aerospace Reports CRC Press
With respect to multi-layered radar absorbing structures (RAS), this book presents an efficient algorithm, based on particle swarm optimization, for the material selection as well as optimization of thickness of multi-layered RAS models. It includes theory required for analysis and procedure for the implementation of PSO based algorithm.
Advances in Electromagnetics of Complex Media and Metamaterials CRC Press
The rapid development of technology based on metamaterials coupled with the recent introduction of the transformation optics technique provides an unprecedented ability for device designers to manipulate and control the behavior of electromagnetic wave phenomena. Many of the early metamaterial designs, such as negative index materials and electromagnetic bandgap surfaces, were limited to operation only over a very narrow bandwidth. However, recent groundbreaking work reported by several international research groups on the development of broadband metamaterials has opened up the doors to an exciting frontier in the creation of new devices for applications ranging from radio frequencies to visible wavelengths. This book contains a collection of eight chapters that cover recent cutting-edge contributions to the theoretical, numerical, and experimental aspects of broadband metamaterials.