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Collana	Springer Series in Materials Science, , 0933-033X ; ; 262
Disciplina	620.11295 620.11297
Soggetti	Optical materials Electronics - Materials Electronic circuits Acoustics Energy harvesting Optical and Electronic Materials Circuits and Systems Electronic Circuits and Devices Energy Harvesting
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Preface -- Concepts from metamaterials to metadevices -- Rationale for metamaterials exploration -- Classification of metamaterials -- Evolution of metamaterials -- Emerging functional metadevices -- Design and fabrication of metamaterials and metadevices -- Common design Approaches for metamaterials -- General tuning methods for metadevices -- Fabrication technology -- Tuning techniques -- Electromagnetic metamaterials and metadevices -- Fundamental theory of electromagnetic metamaterials -- Single negative metamaterials -- Double Negative Metamaterials -- Zero index metamaterials -- Electromagnetic band gap metamaterials -- Bi-isotropic and bi-anisotropic metamaterials -- Microwave metamaterial-inspired metadevices -- Terahertz metamaterials and metadevices -- Introduction -- Passive-type terahertz metamaterials -- Active-type

terahertz metamaterials -- Flexible THz metamaterial sensors -- Photonic metamaterials and metadevices -- Introduction -- Photonic crystals -- Metamaterials designed through transformation optics -- Hyperbolic metamaterials -- Chiral metamaterials and metadevices -- Historical perspective -- Chirality parameter and ellipticity -- Typical chiral metamaterials -- Chiroptical effects -- Typical applications of chiral metamaterials -- Plasmonic metamaterials and metasurfaces -- Plasmonic meta-atoms and their interactions -- Plasmonic metamaterials implementing negative refraction and negative refractive index -- Plasmonic metasurfaces -- Graphene-based plasmonic metamaterials -- Self-assembled plasmonic metamaterials -- Application perspective -- Metamaterials-inspired frequency selective surfaces -- Evolution of frequency selective surfaces -- Design of metamaterial-based miniaturized-element frequency-selective surfaces -- Printed flexible and reconfigurable frequency selective surfaces -- Metamaterials inspired FSS antennas and circuits -- Metamaterial-inspired microfluidic sensors -- Metamaterial-inspired rotation and displacement sensors -- Nonlinear metamaterials and metadevices -- Introduction -- Implementation approaches to manufacture nonlinear metamaterials -- Nonlinear responses and effects -- Acoustic metamaterials and metadevices -- Historical perspective and basic principles -- Dynamic negative density and compressibility -- Membrane-type acoustic materials -- Transformation acoustics and metadevices with spatially varying index -- Space-coiling and acoustic metasurfaces -- Acoustic absorption -- Active acoustic metamaterials -- Emerging directions and future trends -- Mechanical metamaterials and metadevices -- Introduction -- Auxetic mechanical metamaterials -- Penta-mode metamaterials -- Ultra-property metamaterials -- Negative-parameter metamaterials -- Mechanical metamaterials with tunable negative thermal expansion -- Active, adaptive, and programmable metamaterials -- Origami-based metamaterials -- Mechanical metamaterials as seismic shields -- Future trends -- Perspective and future trends -- Emerging metamaterials capabilities and new concepts -- Manipulation of metasurface properties -- Research trends of nonlinear, active and tunable properties -- Emerging metadevices and applications -- Prospective manufacturing and assembly technologies of metamaterials and metadevices.

Sommario/riassunto

To meet the demands of students, scientists and engineers for a systematic reference source, this book introduces, comprehensively and in a single voice, research and development progress in emerging metamaterials and derived functional metadevices. Coverage includes electromagnetic, optical, acoustic, thermal, and mechanical metamaterials and related metadevices. Metamaterials are artificially engineered composites with designed properties beyond those attainable in nature and with applications in all aspects of materials science. From spatially tailored dielectrics to tunable, dynamic materials properties and unique nonlinear behavior, metamaterial systems have demonstrated tremendous flexibility and functionality in electromagnetic, optical, acoustic, thermal, and mechanical engineering. Furthermore, the field of metamaterials has been extended from the mere pursuit of various exotic properties towards the realization of practical devices, leading to the concepts of dynamically-reconfigurable metadevices and functional metasurfaces. The book explores the fundamental physics, design, and engineering aspects, as well as the full array of state-of-the-art applications to electronics, telecommunications, antennas, and energy harvesting. Future challenges and potential in regard to design, modeling and fabrication are also addressed.
