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Prospects -- Chapter 8. Diffusion metamaterials for manipulating conduction and radiation -- Chapter 9. Metamaterials for thermal diffusion: Controlling Radiation and Conduction Simultaneously -- Chapter 10. Thermal metamaterials for controlling thermal conduction, convection and radiation -- Chapter 11. Controlling Multiple Heat Transfer Modalities with Omnithermal Metamaterials -- Chapter 12. Enhancing Thermal Diffusion with Metamaterials: Exploring Omnithermal Restructurable Metasurfaces -- Chapter 13. Geometric Phases in Particle Diffusion: Theory and Modern Applications -- Chapter 14. Particle diffusion process with artificial control: Diffusion metamaterials -- Chapter 15. Diffusion metamaterials for plasma transport.

Sommario/riassunto

This open access book presents a comprehensive exploration of diffusion metamaterials that control energy and mass diffusion. Currently, if from the perspective of governing equations, diffusion metamaterials and wave metamaterials (pioneered by J. B. Pendry in the 1990s) are recognised as the two most prominent branches in the field of metamaterials. These two branches differ in their emphasis on the diffusion equation (as the governing equation) and time-dependent characteristic lengths in diffusion metamaterials, as opposed to the wave equation (as the governing equation) and time-independent characteristic lengths in wave metamaterials. Organized into three distinct parts – 'Thermal Diffusion Metamaterials', 'Particle Diffusion Metamaterials', and 'Plasma Diffusion Metamaterials' – this book offers a rigorous exploration spanning physics, engineering, and materials science, aimed at advancing our understanding of diffusion processes controlled by diffusion metamaterials. Incorporating foundational theory, computational simulations, and laboratory experiments, the book equips researchers and scholars across these disciplines with comprehensive methods, insights, and results pivotal to the advancement of diffusion control. Beyond facilitating interdisciplinary discourse, the book serves as a catalyst for innovative breakthroughs at the crossroads of physics, thermodynamics, and materials science. Essentially, readers will acquire profound insights that empower them to spearhead advancements in diffusion science (diffusionics) and the engineering of metamaterials.