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摘要: Metamaterials, artificial electromagnetic media that are structured on the subwavelength scale, were initially suggested for the negative-index 'superlens'. Later metamaterials became a paradigm for engineering electromagnetic space and controlling propagation of waves: the field of transformation optics was born. The research agenda is now shifting towards achieving tunable, switchable, nonlinear and sensing functionalities. It is therefore timely to discuss the emerging field of metadevices where we define the devices as having unique and useful functionalities that are realized by structuring of functional matter on the subwavelength scale. In this Review we summarize research on photonic, terahertz and microwave electromagnetic metamaterials and metadevices with functionalities attained through the exploitation of phase-change media, semiconductors, graphene, carbon nanotubes and liquid crystals. The Review also encompasses microelectromechanical metadevices, metadevices engaging the nonlinear and quantum response of superconductors, electrostatic and optomechanical forces and nonlinear metadevices incorporating lumped nonlinear components.
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