Metamaterials for Enhanced Optical Responses and their Application to Active Control of Terahertz Waves

Lee, Baek, Kim, Cho, Lee, Kang, Min (2020) Metamaterials for Enhanced Optical Responses and their Application to Active Control of Terahertz Waves *Adv Mater* 32(35) e2000250

Abstract

Metamaterials, artificially constructed structures that mimic lattices in natural materials, have made numerous contributions to the development of unconventional optical devices. With an increasing demand for more diverse functionalities, terahertz (THz) metamaterials are also expanding their domain, from the realm of mere passive devices to the broader area where functionalized active THz devices are particularly required. A brief review on THz metamaterials is given with a focus on research conducted in the authors' group. The first part is centered on enhanced THz optical responses from tightly coupled meta-atom structures, such as high refractive index, enhanced optical activity, anomalous wavelength scaling, large phase retardation, and nondispersive polarization rotation. Next, electrically gated graphene metamaterials are reviewed with an emphasis on the functionalization of enhanced THz optical responses. Finally, the linear frequency conversion of THz waves in a rapidly time-variant THz metamaterial is briefly discussed in the more general context of spatiotemporal control of light.

Links

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