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Accession number:20123015273466

Title:Ultraviolet dielectric hyperlens with layered graphene and boron nitride

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Source title:Journal of Materials Chemistry

Abbreviated source title:J. Mater. Chem.

Volume:22

Issue:31

Issue date:August 21, 2012

Publication year:2012

Pages:15863-15868

Language:English

ISSN:09599428

E-ISSN:13645501

CODEN:JMACEP

Document type:Journal article (JA)

Publisher:Royal Society of Chemistry, Milton Road, Cambridge, CB4 0WF, United Kingdom

Abstract:The concept of hyperlens, as a novel transformation optics device, is a promising real-time super-resolution lens that can effectively transform evanescent waves into propagating waves and thus break the diffraction limit. However, previous hyperlens implementations usually adopted metal which would absorb most of the energy during light transmission and thus deteriorate imaging efficiency. Here we propose a novel hyperlens design based on dielectric layered graphene and h-boron nitride (h-BN) whose performance can surpass the counterpart design with metal. Our first-principle and Kramers-Kronig relation calculation shows that both layered graphene and layered h-BN exhibit strong anisotropic properties in ultraviolet spectrum regions, where their permittivity components perpendicular to the optic axis can be negative, while the components parallel to the optic axis can be positive. Based on the anisotropic properties, flat and cylindrical hyperlenses are designed and numerically verified with layered graphene at 1200 THz and layered h-BN at 1400 THz, respectively. Our work provides a dielectric hyperlens approach to overcome the diffraction limit at ultraviolet frequencies, which may find applications where dynamic imaging of subwavelength features at the molecular and cellular scales is desired. © 2012 The Royal Society of Chemistry.

Number of references:35

Main heading:Graphene

Controlled terms:Anisotropy - Boron nitride - Diffraction - Ultraviolet spectroscopy

Uncontrolled terms:Anisotropic property - Diffraction limits - Dynamic imaging - Evanescent wave - Imaging efficiency - Optic axis - Sub-wavelength - Super resolution - Transformation

optics - Ultraviolet spectrum

Classification code:711.1 Electromagnetic Waves in Different Media - 761 Nanotechnology - 801
Chemistry - 804 Chemical Products Generally - 804.2 Inorganic Compounds - 931.2 Physical
Properties of Gases, Liquids and Solids

DOI:10.1039/c2jm32715e

Database:Compendex

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