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Accession number:20120214669137
Title:Tunable gradient refractive index optics using graded plasmonic crystals with semiconductor rods
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Source title:Journal of the Optical Society of America B: Optical Physics
Abbreviated source title:J Opt Soc Am B
Volume:29
Issue:1
Issue date:January 1, 2012
Publication year:2012
Pages:79-87
Language:English
ISSN:07403224
CODEN:JOBPDE
Document type:Journal article (JA)
Publisher:Optical Society of America, 2010 Massachusetts Avenue NW, Washington, DC 20036-1023, United States
Abstract:Using numerical simulations, we demonstrate the feasibility of tunable gradient refractive index optics at terahertz frequencies based on two-dimensional graded plasmonic crystals (GPCs). They consist of semiconductor rods with spatially dependent radii. In the effective medium approximation, the GPCs can be considered as effective media with a graded effective dielectric permittivity. The semiconductor rods have the Drude-type dispersion. By varying free charge carrier concentration in the rods, it is possible to tune their permittivity. In accordance to effective medium theory, the effective permittivity of the whole GPC is changed at the same time. This property is used for the demonstration of a GPC-based lens with a tunable focus, beam deflector with tunable angle of the beam deflection, and the half Maxwell-fisheye and the Luneburg lens as antennas with tunable radiation patterns. In particular, these GPCs can be made invisible to the incoming radiation by equaling the real part of the rods permittivity to the permittivity of air background. © 2011 Optical Society of America.
Number of references:65
Main heading:Permittivity
Controlled terms:Carrier concentration - Crystals - Directional patterns (antenna) - Lens antennas - Plasmons - Refractive index
Uncontrolled terms:Beam deflection - Beam deflectors - Effective dielectric permittivities - Effective media - Effective Medium Approximation - Effective medium theories - Effective permittivity - Free charge carriers - Gradient refractive index - Luneburg lens - Plasmonic crystals - Real part - Terahertz frequencies - Tunable focus - Tunable radiation
Classification code:701 Electricity and Magnetism - 701.1 Electricity: Basic Concepts and Phenomena - 712.1 Semiconducting Materials - 716 Telecommunication; Radar, Radio and Television - 741.1 Light/Optics - 933.1 Crystalline Solids