

251.Accession number:20125115827256

Title:Extraordinary terahertz absorption bands observed in micro/nanostructured Au/polystyrene sphere arrays

Authors:Duan, Guotao (1); Su, Fuhai (1); Xu, Wen (1); Zhang, Cunlin (3); Cai, Weiping (1)

Author affiliation:(1) Key Laboratory of Materials Physics, Institute of Solid State Physics, Chinese Academy of Sciences, Hefei 230031, China; (2) Department of Physics, Yunnan University, Kunming 650091, China; (3) Beijing Key Laboratory for Terahertz Spectroscopy and Imaging, Key Laboratory of Terahertz Optoelectronics, Department of Physics, Capital Normal University, Beijing 100048, China

Corresponding author:Xu, W.(wenxu_issp@yahoo.cn)

Source title:Nanoscale Research Letters

Abbreviated source title:Nanoscale Res. Lett.

Volume:7

Issue date:2012

Publication year:2012

Language:English

ISSN:19317573

E-ISSN:1556276X

Document type:Journal article (JA)

Publisher:Springer New York, 233 Spring Street, New York, NY 10013-1578, United States

Abstract:Terahertz (THz) time-domain spectroscopy is carried out for micro/nanostructured periodic Au/dielectric sphere arrays on Si substrate. We find that the metal-insulator transition can be achieved in THz bandwidth via varying sample parameters such as the thickness of the Au shell and the diameter of the Au/dielectric sphere. The Au/polystyrene sphere arrays do not show metallic THz response when the Au shell thickness is larger than 10 nm and the sphere diameter is smaller than 500 nm. This effect is in sharp contrast to the observations in flat Au films on Si substrate. Interestingly, the Au/polystyrene sphere arrays with a 5-nm-thick Au shell show extraordinary THz absorption bands or metallic optical conductance when the diameter of the sphere is larger than 200 nm. This effect is related to the quantum confinement effect in which the electrons in the structure are trapped in the sphere potential well of the gold shell. © 2012 Duan et al.

Number of references:12

Main heading:Spheres

Controlled terms:Absorption spectra - Gold - Quantum confinement - Semiconductor insulator boundaries - Shells (structures) - Silicon

Uncontrolled terms:Au film - Gold shell - Micro/nanostructures - Potential wells - Quantum confinement effects - Sharp contrast - Shell thickness - Si substrates - Sphere array - Sphere diameter - Tera Hertz - Terahertz absorption - Terahertz time-domain spectroscopy

Classification code:933 Solid State Physics - 741.1 Light/Optics - 714.2 Semiconductor Devices and Integrated Circuits - 712.1.1 Single Element Semiconducting Materials - 631 Fluid Flow - 547.1 Precious Metals - 408.2 Structural Members and Shapes

DOI:10.1186/1556-276X-7-657

Database:Compendex

Compilation and indexing terms, Copyright 2012 Elsevier Inc.