光子学报 2010, 39(6) 1120-1124 DOI:
ISSN: 1004-4213 CN: 61-1235/O4

论文

二氧化钒纳米点阵红外光学特性研究

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摘要：

针对二氧化钒纳米点阵从半导体到金属的可逆相变，考虑到点阵中各个点之间散射光的交互作用，基于VO2在不同温度和波长下的折射率和消光系数，以及小颗粒的吸收和散射特性，建立了VO2纳米颗粒的数学模型，研究了VO2纳米颗粒的相变光学特性。结果表明，随着波长变化，吸收截面相对散射截面占主导，金属相在980nm附近出现吸收峰值；随着温度变化，可见光区域的消光系数变化较小，而红外区域较大，其中在近红外区域的消光系数变化最大。在纳米点阵中，消光截面随着颗粒间距变化，当颗粒间距增大时，消光峰值出现红移，且峰值大小也会随之增大；当间距超过一定数值后，峰值反而会逐渐减小。

关键词： 二氧化钒 纳米颗粒 纳米点阵 散射截面 吸收截面

Study on Infrared Optical Properties of VO2 Nano-array

Abstract:

The interaction of scattering light between nanoparticles in nano-array was considered in its phase transition from semiconductor to metal. The mathematical model of vanadium dioxide nanoparticle was established based on the

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absorption and scattering properties of small particles, as well as the property of complex refractive changing with the various different temperature and wavelength. The results show that the main contribution to the optical response with variational wavelength is absorption cross section in the infrared, and the absorption peak of metal phase is near 980nm. The change of extinction coefficient is larger in the infrared region than in the visible region. The study indicated that the extinction cross section of nano-array is depended on the distance between particles. When the distance between particles increases, the peak position of extinction cross section appears red-shift and the peak value of extinction cross section increases. However, when the distance is more than a certain value, the peak will decrease.

Keywords: Vanadium dioxide nanoparticles nano-arrays scattering cross section absorption cross section

收稿日期 2009-07-11 修回日期 2009-09-07 网络版发布日期 2010-06-25

DOI:

基金项目: