

论文

Cu/AAO纳米有序阵列复合结构的光吸收特性

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摘要:

采用电化学沉积工艺, 成功制备了铜/氧化铝(Cu/AAO)纳米有序阵列复合结构. 研究结果发现, 在λ为570 nm附近出现了明显的Cu表面等离子共振吸收峰, 且随Cu沉积量的增加, 吸收峰位稍有蓝移, 其强度逐渐增强, 峰形由宽变锐; 另外还发现, 该结构的吸收边随着Cu沉积量(或长径比)的增加大幅度红移, 可以实现在近紫外至近红外的大范围内移动, 最大频移量超过500 nm, 且Cu表面等离子振荡吸收峰会随着吸收边的大幅度红移被掩盖而逐渐消失. 对该结构光吸收边的调制机理进行了理论分析, 阐释了吸收峰逐渐消失的原因, 并从理论上定性地解释了导致吸收峰位蓝移及宽化的主要原因.

关键词: 纳米有序阵列 表面等离子共振 吸收峰 吸收边

Absorption Properties of Ordered Cu/AAO Nano-array Composite Structures

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Abstract:

Ordered Cu/AAO nano-array composite structures were fabricated by the electrodeposition method within the cylindrical pores of anodic aluminum oxide(AAO) membranes and their optical properties were characterized by absorption spectrum in the range of 200-1000 nm. The experiments show that the surface plasma resonance(SPR) peak appeared around a wavelength of 570 nm, which had a little blue shift and strengthened with the increase of Cu deposition, and gradually disappeared with a larger red shift of the absorption edge over 500 nm. These interesting phenomenon can be well qualitatively described in the framework of the Maxwell-Garnett(M-G) theory. Here, the theoretically analyzed modulation mechanism of the composites' absorption edge expatiates the absorption peak disappearance with the increase of Cu deposition.

Keywords: Ordered nano-array Surface plasma resonance Absorption peak Absorption edge

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