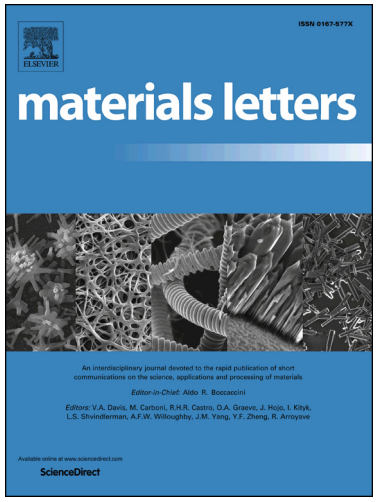

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Dual-band plasmonic perfect absorber based on all-metal nanostructure for refractive index sensing application

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ABSTRACT

We present a simple design of a dual-band plasmonic perfect absorber (PA) based on all-metal nanostructure for ultra-sensitive refractive index (RI) sensing applications in infrared region. The proposed PA is only consisted of an assembly of vertical-split-ring (VSR) structure array adhered on a continuous gold film. The numerical simulation results show that the designed PA can achieve absorbance of 99.1% and 98.8% with quality-factor (Q-factor) of 16.4 and 19.8 at 163.6 THz and 258.8 THz, respectively. The physical origin of the observed absorption is elucidated through distributions of magnetic field and power loss density at resonances. The designed PA served as a refractive index (RI) sensor can achieve sensitivity of 1518 and 959 nm/refractive index unit (RIU), respectively. The proposed dual-band PA could be a desirable candidate for applications in the RI sensing, notch filtering and the enhanced infrared spectroscopy.

Keywords: Metamaterials, plasmonic perfect absorber, all-metal nanostructure, simulation and modeling, sensors.

1. Introduction

Recently, electromagnetic (EM) or optical metamaterial (MM) perfect absorbers (PAs) have been paid great attention increasingly since the perfect absorption concept was firstly demonstrated experimentally by Landy et. al [1]. Optical PAs are generally categorized into narrowband and broadband in terms of the

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