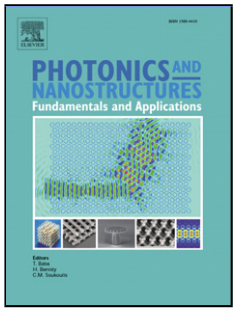

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Ultra-wideband polarization insensitive UT-shaped metamaterial absorber

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Highlights:

- An ultra-wideband metamaterial absorber with double layers of UT-shaped resonator and the ground plane which is made of titanium and gold is proposed.
- The absorption mechanism is relies on the surface impedance tuning caused by UT-shaped resonator and resistive sheet effect of titanium layer in the structure.
- The absorber performance is also analyzed by the interference theory and it is shown that the theoretical results are in good agreement with the simulation results.
- A polarization insensitive absorber with two rotated UT-shaped resonators is proposed.

Abstract- In this paper, an ultra-wideband metamaterial absorber (MMA) with U and T shaped resonators has been proposed. The resonators and the ground plane consist of gold (Au) and titanium (Ti) layers. The resistive sheet effect of Ti layer and the resonance elements in the structure cause a broad absorption spectrum. The simulations are based on the finite element method (FEM) and the results show that the absorption of the proposed structure is more than 90% between 150 and 300 THz that is much larger than previous works. Moreover, by applying the interference theory, we have demonstrated that the simulation results are in good agreement with the theoretical results. The primary proposed MMA is polarization sensitive. Therefore, a polarization insensitive metamaterial absorber has been suggested. Also, because of the extra resonance elements the full width at 90% absorption increases about 35 THz. This ultra-wideband MMA has various applications in microbalometer, imaging, thermal emitters, photovoltaic, and energy harvesting.

Keywords: Metamaterial absorber, Nanostructure, Polarization insensitive, Resonator, Ultra-wideband.

1. Introduction

In the past decades electromagnetic metamaterials have attracted researchers' attention due to their unusual properties such as negative refractive index (NRI), near zero index (NZI) and magnetic response in optical regime. First NRI metamaterial was proposed by Smith in 2000 [1] and after that a wide range of applications such as antenna, energy harvesting, super lens, waveguides and absorbers have been defined for metamaterials [2].