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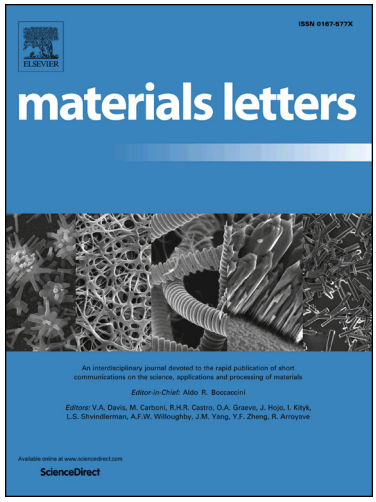

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Direct Laser Fabrication of Five-Band Symmetric Terahertz Metamaterial with Fano Resonance

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Abstract

Textured metallic surfaces such as metamaterial provide an increased plasmonic activity which result in localized field enhancement in terahertz frequency range. A simple and novel planar multi-band THz metamaterial with closely spaced band resonance for sensing application is presented. Numerical simulation of the designed structure was done using CST Microwave studio software. A rapid direct writing process using ultrafast laser was adopted for fabricating the proposed multi-band MM structure. The proposed structure displayed band stop characteristics at five frequencies 0.51THz, 0.56THz, 0.69THz, 0.7THz and 0.79THz respectively with a loss exceeding 50dB. A sharp Fano resonance was observed at 0.66THz frequency from the constructive interference between the resonators. The terahertz transmission characteristic of the fabricated structure was done using THz-TDS technique.

Keywords : Metamaterial; Multi-band; Plasmonics; Terahertz; Laser; Femtosecond

Introduction

Metamaterials enable the development of novel devices with exotic properties which are not exhibited by the naturally available materials. Metamaterials have artificially made composite structure which consists of periodically placed repeated elements with geometrical dimensions with spacing less than the desired wavelength. These metamaterials with negative refractive index are of vital importance in many sensing, cloaking, lens, miniaturized devices, data storage, etc. In essence, these metamaterials offer a significant improvement in label-free detection of bio and chemical components due to the presence of spoof surface plasmon and enhanced localization of electric field[1,2].