

Single- and double-sided sensor applications of metamaterials based on square-ring and diamond resonators for terahertz region

Najlaa Shawky and Salah Al-deen Adnan Taha

*Department of Laser and Optoelectronic Engineering,
University of Technology, Baghdad, Iraq*

Hakan Altan

*Department of Physics, Middle East Technical University,
06800 Ankara, Turkey*

Cumali Sabah

*Department of Electrical and Electronics Engineering,
Middle East Technical University, Northern Cyprus Campus,
Kalkanlı, Güzelyurt, TRNC/Mersin 10, Turkey
Kalkanlı Technology Valley, Middle East Technical University,
Northern Cyprus Campus, Kalkanlı, Güzelyurt, TRNC/Mersin 10, Turkey
sabah@metu.edu.tr*

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This study investigates the sensing applications of metamaterial (MTM) structures in the terahertz (THz) region and is based on a broadside-coupled diamond and square-ring resonator (DSRR) structures. The resonators are designed and simulated as sensors in detail. Compared with single-sided sensors, the sensing capability of double-sided sensors provide an enhancement with respect to the sensitivity. To analyze the structure as sensor, the changes in the transmission resonance are investigated as a function of the permittivity and thickness of overlayer for the single- and double-sided MTM. The results demonstrate that this design can provide good sensitivity when sensing the chemical or biological agents that are resonant in the terahertz region of the electromagnetic spectrum. These types of designs can be employed in the many sensing applications that are of interest in the THz region.

Keywords: Metamaterial; single-sided sensor; double-sided sensor; terahertz.

1. Introduction

One of the most popular unit cell structures used in the creation of metamaterials is the ring resonator. Because of the unique properties of metamaterials, those ring resonators that exhibit a negative permeability and/or negative refractive index