Tunable plasmonic response of linked dimer disks based on InSb in terahertz range

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Received: 21.07.2017 Final revised: 02.07.2018 Accepted: 09.06.2018

Abstract

In this paper, we have investigated numerically optical properties of a periodic array of linked dimer disks based on InSb, in the THz range, by FDTD (finite difference time domain) method. Simulation results show two THz plasmonic modes; charge transfer plasmon mode (CTP) and bonding dipole plasmon (BDP) mode. The CTP mode originates from the conductive junction of linked dimer disks and the BDP mode is due to the coupling of plasmons. The study showed that optical properties of the proposed structure are highly tunable by varying the geometric parameters of the conductive junction. The length reduction of the bridge between dimer disks increases the localized electric field intensity, and the width enhancement of the path way between dimer disks results in the decrement and increment of the amplitudes of the CTP and BDP modes, respectively. The proposed structure is sensitive to polarization angle of incident light in the frequency range of 0.1 to 2.2 terahertz that can be used as polarization switch in THz range. This plasmonic structure can have significant applications in the field of security, imaging, and spectroscopy in the THz range.

Keywords: Indium antimonide (InSb), Plasmonic, Terahertz, Charge transfer

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