

Terahertz Plasmonic Structure With Enhanced Sensing Capabilities - DTU Orbit (09/11/2017)

Terahertz Plasmonic Structure With Enhanced Sensing Capabilities

We have designed, fabricated, and experimentally verified a highly sensitive plasmonic sensing device in the terahertz frequency range. For a proof of concept of the sensing phenomenon, we have chosen the so-called fishnet structure based on circular hole array insensitive to the polarization of the incident wave. We employ the localized resonance associated with the cutoff frequency (electric plasma frequency) of the hole array to investigate its sensing capability. A thin-film overlayer deposited on the surface of the metallic apertures causes an amplitude modulation and a shift in the resonant frequency of the terahertz transmission. The frequency shift and the amplitude modulation were investigated as a function of the refractive index and the thickness of the overlayer for determining the sensing potential of the proposed structure. Measurements carried out using terahertz time-domain spectroscopy show good agreement with the numerical predictions. The results we obtained indicate that the proposed device could be very promising for enhancing the sensing capabilities of the refractive index changes involved in bio-applications, for instance.

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