Design of Structures Including MoS_2 Monolayer with Low Absorption at THz Range for Application in Transparent Electrodes

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Abstract

Two dimensional Molybdenum disulfide, MoS_2, crystal has attracted intense attention for its application in the THz optoelectronics and can be used for transparent electrode in the nanoscale research area. In this paper, we design structures including MoS_2 monolayer on different substrates and different layer positions in one-dimensional photonic crystals (1DPCs) toward decreasing the optical absorption. The THz refractive index of MoS_2 taken from Drude model is calculated. Transmission and absorption spectra in the THz range for either of TE or TM modes are calculated based on the transfer matrix method (TMM). Following this, we show that the absorption spectrum can be tuned by changing different materials and incident angles for either of TE or TM modes. In our best design, we finally achieved absorption smaller than MoS2 monolayer and nearly 100% transmission. Such results are useful for application in nano-bulding blocks including transparent electrode in future photonics and electronics devices.

Keywords: Transparent electrode, Photonics crystal, Terahertz, Drude model, Transfer matrix method, Molybdenum disulfide

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