Design and Analysis of Plasmonic Switch at mid-IR Wavelengths using Graphene Nano-Ribbons

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Abstract

Taking advantage of the chemical potential (μ_c) of one and multi-layers of graphene nano-ribbons, we designed and analyzed the performance of plasmonic switches at mid-IR wavelengths. By slightly varying the chemical potential of graphene, significant resonance shift ($\Delta\lambda$) and modulation depth (MD) are achieved. Using the finite element method, our numerical simulations show that a plasmonic switch, made up of hexagonal boron nitride (hBN)/Graphene, has relatively large MD and wavelength shifts with N=6, and $\mu_c$varyingfrom 0.3eVto 0.4eV, 14 dB and 2.8μm. The proposed structure is useful for research on compact and largely tunable mid-infrared photonic devices in order to realize on-chip CMOS optoelectronic systems.

Keywords: Chemical potential, Graphene nano-ribbon, Plasmonic, Modulation depth, Wavelength shift, Switch.

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