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标题: Synthesis of highly confined surface plasmon modes with doped graphene sheets in the midinfrared and terahertz frequencies
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摘要: We investigate through analytic calculations the surface plasmon dispersion relation for monolayer graphene sheets and a separated parallel pair of graphene monolayers. An approximate form for the dispersion relation for the monolayer case was derived, which was shown to be highly accurate and offers intuition to the properties of the supported plasmon mode. For parallel graphene pairs separated by small gaps, the dispersion relation of the surface plasmon splits into two branches, one with a symmetric and the other with an antisymmetric magnetic field across the gap. For the symmetric (magnetic field) branch, the confinement may be improved at reduced absorption loss over a wide spectrum, unlike conventional surface plasmon modes supported on metallic surfaces that are subjected to the tradeoff between loss and confinement. This symmetric mode becomes strongly suppressed for very small separations, however. On the other hand, its antisymmetric counterpart exhibits reduced absorption loss for very small separations or long wavelengths, serving as a complement to the symmetric branch. Our results suggest that graphene plasmon structures could be promising for waveguiding and sensing applications in the midinfrared and terahertz frequencies.
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