Localized plasmons in bilayer graphene nanodisks - DTU Orbit (03/10/2019)

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We study localized plasmonic excitations in bilayer graphene (BLG) nanodisks, comparing AA-stacked and AB-stacked BLG and contrasting the results to the case of two monolayers without electronic hybridization. The electrodynamic response of the BLG electron gas is described in terms of a spatially homogeneous surface conductivity, and an efficient alternative two-dimensional electrostatic approach is employed to carry out all the numerical calculations of plasmon resonances. Due to unique electronic band structures, the resonance frequency of the traditional dipolar plasmonic mode in the AA-stacked BLG nanodisk is roughly doping independent in the low-doping regime, while the mode is highly damped as the Fermi level approaches the interlayer hopping energy $\gamma$ associated with tunneling of electrons between the two layers. In addition to the traditional dipolar mode, we find that the AB-stacked BLG nanodisk also hosts a new plasmonic mode with energy larger than $\gamma$.

This mode can be tuned by either the doping level or structural size, and, furthermore, this mode can dominate the plasmonic response for realistic structural conditions.

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Contributors: Wang, W., Xiao, S., Mortensen, N. A.
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