Colloquium
Dahlem Center for Complex Quantum Systems

Encapsulated Graphene Plasmons

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Abstract:

We discuss the determination of the plasmon spectrum of an encapsulated 2D layer and apply it to graphene confined by a pair of thick conducting materials*. In this, we solve the RPA integral equation analytically in 3D position representation for the inverse dielectric screening function of a system composed of two identical semi-infinite conducting plasmas with planar bounding surfaces at $z = \pm a/2$ enclosing a 2D semiconductor plasma in a narrow spatial gap region $|z| < a/2$. We have evaluated the nonlocal plasmon dispersion relation computationally for both gapped and gapless graphene as the 2D semiconductor plasma. The associated nonlocal graphene plasmon spectrum of the coupled “sandwich” system is exhibited in density plots which exhibit a linear mode and a pair of depolarization modes shifted from the bulk plasma frequency.

*G. Gumbs, N.J.M. Horing, A. Iurov, and D. Dahal, “Plasmon Excitations for Encapsulated Graphene”, Journal of Physics D: Applied Physics, accepted for publication and in press.