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Identifying the Optical Response of Graphene Using Electron Energy-Loss Spectroscopy

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Graphene, due to its intrinsic two-dimensional and flexible structure, excellent electronic transport and unusual optical properties is believed to be an ideal candidate material for the next generation of plasmonic devices. Yet, despite previous studies of the energy loss function of monolayer graphene [1], there has not been a study that actually shows that the optical response of clean, freely suspended graphene has singularities and thus presents plasmons.

In this talk, we will present the dielectric function of monolayer graphene obtained by electron energy-loss spectroscopy (EELS) in a low-voltage aberration-corrected scanning transmission electron microscope (STEM). We will discuss in detail the methods to obtain the optical response of two-dimensional materials from EELS experiments, and present further insights into whether the optical response of graphene is formed by plasmons or other electronic excitations [4].

References

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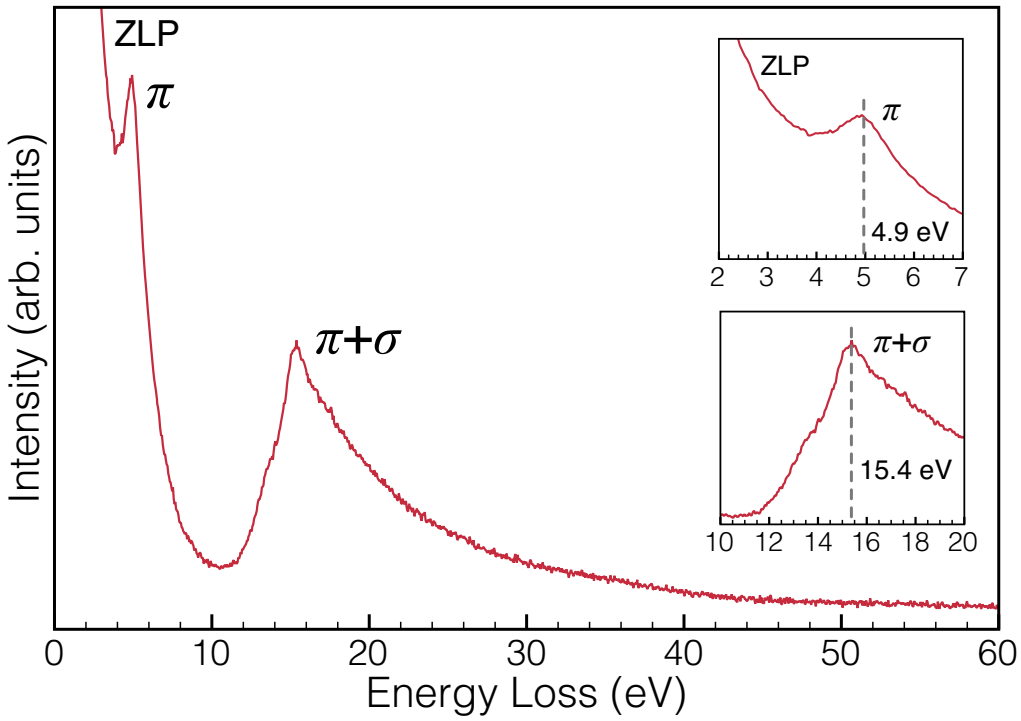

FIG. 1. EELS spectrum of monolayer graphene measured up to 60 eV. Three main features are visible in the spectrum, the zero loss peak (ZLP), which is composed of electron that do not go through inelastic scattering, and two absorption peaks labeled π and π+σ. The insets highlight the position and shape of the π and π+σ peaks. The spectra were acquired while scanning the atomic-size electron beam in a clean region, free of defects, with an area of 8×8 nm^2.

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