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Probing the dielectric response of the interfacial buffer layer in epitaxial graphene via optical spectroscopy

Monolayer epitaxial graphene (EG) is a suitable candidate for a variety of electronic applications. One advantage of EG growth on the Si face of SiC is that it develops as a single crystal, as does the layer below, referred to as the interfacial buffer layer (IBL), whose properties include an electronic band gap. Though various electrical and non-optical probing experiments have been conducted on this buffer layer, most recently reported in Nano Letters by *Nair, et al. (2017)* [1], studies pertaining to its optical properties have not yet been rigorously explored. In this work, we combine measurements from Mueller matrix ellipsometry, differential reflectance contrast, atomic force microscopy, and Raman spectroscopy, as well as calculations from Kramers-Kronig analyses and density functional theory (DFT), to determine the dielectric function of the IBL within the energy range of 1 eV to 8.5 eV.

References

[1] Nair, M.N.; Palacio, I.; Celis, A.; Zobelli, A.; Gloter, A.; Kubsky, S.; Turmaud, J.-P.; Conrad, M.; Berger, C.; de Heer, W.; Conrad, E.H.; Taleb-Ibrahimi, A.; Tejada, A. Nano Lett., 17 (2017), 2681-2689.

Figures

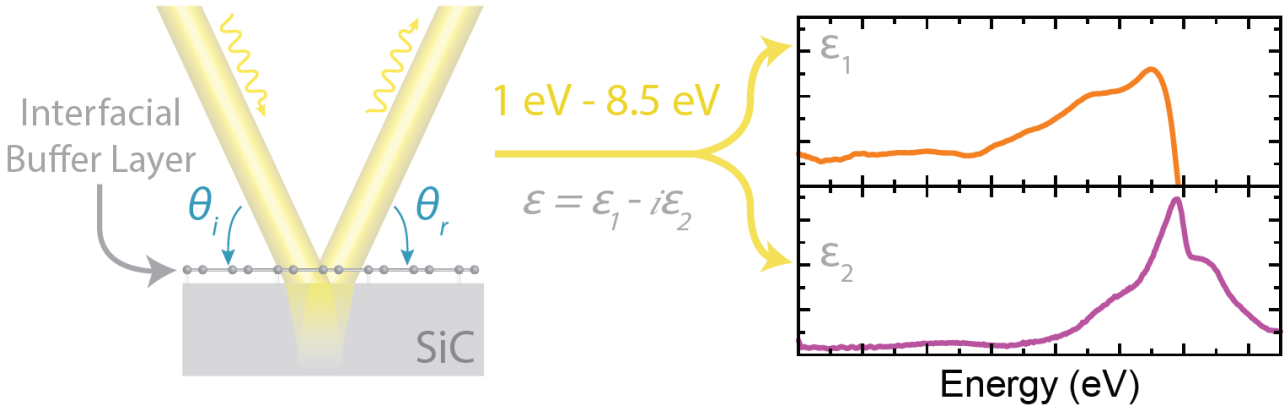

Figure 1: A schematic of the Mueller matrix ellipsometer measurement is shown. Broadband light is directed to the IBL at variable incident angles, and the tool evaluates the change in polarization and intensity as a function of the incident angle. Both the real and imaginary portions of the dielectric function for the IBL are extracted using this technique and are subsequently compared to differential reflectance contrast measurements and density functional theory calculations.