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Environmental Effects on the Terahertz Surface Plasmons in Epitaxial Graphene PAULA FEKETE, Department of Physics and Nuclear Engineering, US Military Academy at West Point, NY, GODFREY GUMBS, Hunter College of the City University of New York, NY, ANDRII IUROV, Center for High Technology Materials, University of New Mexico, Albuquerque, New Mexico, JHAO-YING WU, MING-FA LIN, Department of Physics, National Cheng Kung University, Tainan, Taiwan 701 — We predict the existence of low-frequency nonlocal plasmons at the vacuum-surface interface of a superlattice of N graphene layers interacting with conducting substrate. We derive a dispersion function that incorporates the polarization function of both the graphene monolayers and the semi-infinite electron liquid at whose surface the electrons scatter specularly. We find a surface plasmon-polariton that is not damped by particle-hole excitations or the bulk modes and which separates below the continuum mini-band of bulk plasmon modes. The surface plasmon frequency of the hybrid structure always lies below a limiting value of the surface plasmon frequency of the conducting substrate. The intensity of this mode depends on the distance of the graphene layers from the conductor's surface, the energy band gap between valence and conduction bands of graphene monolayer and, most importantly, on the number of two-dimensional layers. For a sufficiently large number of layers ($N > 7$) the hybrid structure has no surface plasmon. The existence of two plasmons with different dispersion relations indicates that quasiparticles with different group velocity may coexist for various ranges of wavelengths determined by the number of layers in the superlattice.

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