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Conductance behaviors of point-contact graphite junctions with normal metal and superconducting tips[1] W. K. PARK, S. WOLIN, C. CHIALVO, N. MASON, L. H. GREENE, Department of Physics and the Frederick Seitz Mater. Res. Lab., University of Illinois at Urbana-Champaign — The recent discovery of graphene, a truly two-dimensional carbon allotrope, has attracted great interest because of its novel physics and potential for new electronic device applications. Among a variety of theoretical predictions that await stringent experimental tests, reflectionless tunneling (Klein paradox) and specular Andreev reflection are most intriguing. Aiming at eventually probing such unique charge transport phenomena in graphene junctions, we first investigate conductance behaviors of the nanoscale graphite junctions made by point-contact techniques using simple metal (Au) and superconducting (Nb) tips. At low temperatures, the conductance data exhibit an inverse peak structure centered at zero bias, reminiscent of the theoretical density of states arising from the Dirac-like dispersion relation. Junctions with Nb show the additional superconducting gap feature. We will present sets of conductance spectra as a function of temperature, magnetic field, and gate voltage, and discuss possible mechanisms to explain the observed conductance behaviors.

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