Abstract Submitted
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Real-Space Magnitude and Spatial Extent of the Surface Charge Density of Graphene[1] P. XU, Y. YANG, S.D. BARBER, M.L. ACKERMAN, J.K. SCHOELZ, SALVADOR BARRAZA-LOPEZ, L. BELLAICHE, P.M. THIBADO, Department of Physics, University of Arkansas, IGOR A. KORNEV, Proprietes et Modelisation des Solides, France — The discovery of graphene, a unique two-dimensional electron system with extraordinary physical properties, has ignited tremendous research activity in both science and technology. One such extraordinary property is its enormous current-carrying capacity of 1μA per atomic row. Fundamentally, this suggests that graphene possesses an unusually large electronic density of states (DOS). Surprisingly, a detailed atomic-scale investigation of the DOS has yet to be completed. Here we present, for the first time, variable-current scanning tunneling microscopy (STM) images, which reveal an unusual three-dimensional picture of graphene's orbitals. Furthermore, density functional theory was used to simulate the variable-current STM images. From this we found that the orbitals expand to fill the holes in the honeycomb structure, making atomic-resolution STM more difficult at lower currents. Also, we discovered that the wavefunctions expand into the vacuum an unusually large amount. Identical studies were performed on graphite, revealing that the DOS of graphene is 300% larger. Other significant differences found between graphite and graphene will be discussed.

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