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d+id'-wave Superconducting States in Graphene and Andreev Reflection DAOXIN YAO, Purdue University, YONGJIN JIANG, Zhejiang Normal University, ERICA W. CARLSON, Purdue University, HAN-DONG CHEN, University of Illinois at Urbana-Champaign, JIANGPING HU, Purdue University
— We study the d+id superconducting state in graphene through proximity effect. By introducing short range pairing (i.e. bond singlet pairing), we found that some effective, low energy pairing order parameter with symmetries will emerge. This is due to the Dirac cone structure in graphene at low energy. We focus on the d+id' pairing order between nearest neighbor sites on the honeycomb lattice of graphene. At low energy, the effective pairing has a p+ip-wave pairing component and a s-wave pairing component, which has a dramatic effect on band structure, Andreev reflection, differential conductance. For the energy gap, we found that it is dominated by p+ip-wave symmetry at low doping and saturated at high doping which is related to s-wave symmetry. The Andreev conductance spectra shows remarkable difference between d+id' wave and s-wave pairing case (including extended s-wave). We point out that an recent Andreev reflection experiment is consistent with our d+id' calculation. In the end, we discuss the possible ways to realize this d+id' superconducting state in graphene. Reference: Y. J. Jiang, D. X. Yao, E. W. Carlson, H.-D. Chen and J. P. Hu, arXiv:0710.3962

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