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Superconducting Proximity Effect in Monolayer and Bilayer Graphene: Critical Current and Pair Amplitude MASAHIKO HAYASHI, Akita University, HIDEO YOSHIOKA, Nara Women's University, AKINOBU KANDA, University of Tsukuba — We study the superconducting proximity effect in monolayer and bilayer graphene, especially paying attention to the effects of band structure. The free energy of the superconductor-graphene-superconductor junction is calculated based on the tunnel Hamiltonian and the critical current through the junction and the pair amplitude in graphene are obtained. We numerically estimate the critical current for several forms of junctions and discuss the correspondence with experimental observations. The behavior of the proximity effect in monolayer system is rather close to that in normal metal, which shows monotonic dependence on temperature and junction separation. However, remarkably, the bilayer system shows a novel oscillating behavior as a function of temperature and junction separation. We discuss the origin of these behaviors by studying the pair amplitude in graphene.

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