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Anomalous Quantum Oscillations in Graphene Hybrid Structures

CONOR PULS, NEAL STALEY, YING LIU, The Pennsylvania State University, Department of Physics — It is well recognized that the edge states of graphene are interesting and important for both fundamental inquiry and potential practical applications of graphene. However, states associated with a step found in a continuous sheet of graphene with two different thicknesses have not been explored to date. We report a study of graphene hybrid structures featuring such a step. In a bulk hybrid featuring two large-area one- and two-layer graphene, two sets of Landau levels and features related to the interface were found. In edge hybrids featuring a large two-layer graphene with narrow one-layer graphene edges, we observed an anomalous suppression in quantum oscillation amplitude due to the locking of one- and two-layer graphene Fermi energies by charge transfer across the interface. These findings demonstrate the existence of unique interface states and related phenomena deserving of further studies. We will also report relevant studies on epitaxially-grown graphene films.

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