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Coulomb Drag in Independently Contacted Graphene Bilayers[1]
SEYOUNG KIM, INSUN JO, JUNGHYO NAH, YAO ZHEN, SANJAY BANERJEE, EMANUEL TUTUC, The University of Texas at Austin — Two graphene layers placed in close proximity, and electrically isolated, offer a unique system to investigate interacting electron physics. In such graphene bilayer, the interlayer spacing can be reduced to values much smaller than otherwise achievable in semiconductor heterostructures. Moreover, the zero energy band-gap allows the realization of coupled hole-hole, electron-hole, and electron-electron two-dimensional systems in the same sample. Here we demonstrate the realization of independently contacted graphene bilayers. We probe the resistance and density of each layer, and quantitatively explain their dependence on the back-gate bias. We experimentally measure the Coulomb drag between the two graphene layers, by flowing current in one layer and measuring the voltage drop in the opposite layer. The drag resistivity gauges the momentum transfer between the two layers, which in turn probes the interlayer coupling. The temperature dependence of the Coulomb drag above temperatures of 77K reveals that the ground state in each layer is a Fermi liquid. Below 77K we observe mesoscopic fluctuations of the drag resistivity, as a result of the interplay between coherent transport in the graphene layer and interlayer interaction.

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