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Density of States and Its Local Fluctuations Determined by Capacitance of Strongly Disordered Graphene[1] XIAOLONG CHEN, WEI LI, LIN WANG, YUHENG HE, ZEFEI WU, YUAN CAI, MINGWEI ZHANG, YANG WANG, YU HAN, ROLF W. LORTZ, ZHAO-QING ZHANG, PING SHENG, NING WANG, Hong Kong University of Science and Technology — We demonstrate that local fluctuations of the density of states (DOS) in strongly disordered graphene play an important role in determining the quantum capacitance of the top-gate device geometry. Depending on the strength of the disorder induced by metal-cluster decoration, the measured quantum capacitance of disordered graphene could dramatically decrease in comparison with pristine graphene (previous work on transport of metal-cluster decoration has been published on Phys. Rev. B 84, 045431, 2011). A quantitative model for correlating fluctuations of local density of states with the disorder strength and quantum capacitance is presented and discussed. The DOS of disordered graphene obeys a non-universal power law. By measuring the quantum capacitance of disordered graphene, we simultaneously determined both the DOS and its local fluctuations, which is in agreement with the lognormal distributions reported previously for localized samples.

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