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Large Scale Mesoscopic Transport in Nanostructured Graphene HAIJING ZHANG, JIANMING LU, WU SHI, ZHE WANG, TING ZHANG, MINGYUAN SUN, YUAN ZHENG, QIHONG CHEN, NING WANG, Hong Kong University of Science and Technology, JUHN-JONG LIN, National Chiao Tung University, PING SHENG, Hong Kong University of Science and Technology — We report the observation of strong 2D Anderson localization at the charge neutrality point (CNP) in nanostructured antidot graphene samples. A localization length of 2 micron is obtained through sample size scaling up to 10 micron. Localization length is seen to increase with applied magnetic field, in accurate agreement with the theoretical prediction of Ono [Prog. Theor. Phys. Suppl. 84, 138 (1985)]. Our observation is made possible by the very large dephasing length of 10 micon, owing to the opening of a Coulomb quasigap, observable below 25 K, that suppresses the inelastic electron-electron scatterings. Such a large dephasing length is further substantiated by the observation of a crossover from the mesoscopic transport (with exponential size scaling) to diffusive transport (with size independence) at 10 micron. Large scale mesoscopic transport may provide promising future to graphene nanoelectronic device applications.

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