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Quantum dot in semiconducting single walled carbon nanotube on thin hexagonal boron nitride ZHENGYI ZHANG, AREND VAN DER SANDE, Department of Mechanical Engineering,Columbia University, MITSUHIDE TAKEKOSHI, Department of Physics,Columbia University, XIAO GUO, Department of Mechanical Engineering, Columbia University, PHILIP KIM, Department of Physics,Columbia University, JAMES HONE, Department of Mechanical Engineering, Columbia University — Carbon nanotube(CNT) is one of the best available systems to study the one dimensional physics. However, so far most of the studies are based on the devices made of CNT on SiO_2/Si substrate, which introduces a large amount of trapped charges causing the spatial variation of the Fermi energy of CNT. It separates CNT into multiple islands preventing its formation of single, well defined quantum dot. Recently it is found that suspended metallic nanotube shows 100meV band gap, 20 times compared with the one on SiO_2/Si substrate, which also suggests the trapped charges can obscure many intrinsic properties of CNTs. In this study, we perform the transport measurements of ultra-clean semiconducting CNT transferred on to 5nm thick of hexagonal boron nitride(h-BN) with 10nm thick graphite as back gate. At room temperature, it shows nearly hysteresis free low bias transport. And a clear coulomb blockade feature is observed at 2K in vacuum, which was only obtained in clean suspended nanotubes before. These all suggest that h-BN is an ultraclean and uniform substrate for study of the intrinsic nature of CNT.

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