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Manipulating graphene mobility and charge neutral point with ligand-bound nanoparticles as charge reservoir[1] DEQI WANG, Department of Physics & Astronomy, University of California, Riverside, XINFEI LIU, LE HE, YADONG YIN, DI WU, JING SHI — In this work, we first demonstrate a significant enhancement in carrier mobility in SiO2-supported graphene decorated with a layer of ligand-bound nano-particles (NPs) such as iron oxide, titanium dioxide, or cadmium selenide acting as a charge reservoir. By transferring charges between graphene and the NP reservoir through the molecules, we show a remarkable reversible tunability in mobility (4,000 – 19,000 cm2/Vs) in the same device, which unambiguously proves that the charged impurity scattering is the prevailing mechanism for graphene mobility. In addition, the charge neutral point can also be independently tuned over a wide gate voltage range. Finally, we study the thermopower of graphene sample with different mobility. By properly taking account of the high temperature effects, we obtain good agreement between the Boltzmann transport theory and our experimental data.

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Deqi Wang
Department of Physics & Astronomy,
University of California, Riverside

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