

Observation of single electron tunneling in strongly coupled gold-nanoparticle assembly.

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This work experimentally studied the charge transport properties of two dimensional self-assembled gold nanoparticles (AuNPs), which were surface-modified by 3-mercaptopropionic acid (MPA). The molecule is short, resulting in a nanoparticle assembly of strongly coupled AuNPs. The samples with e-beam exposure are metallic, while those without exposure are insulating. Showing Coulomb blockade modulated by a gate voltage at the temperature of 40mK, the insulating device demonstrated the electrical conduction nature as a single electron transistor^{1 2}. A magnetic field in perpendicular to the substrate would suppress such single electron tunneling and transistor effect. On the other hand, the metallic devices appeared no gating-effect and showed anti-weak localization at 80mK.

¹Klein, D. L. and R. Roth, Nature **389** 6652(1997).

²Bolotin, K. I., F. Kuemmeth, et al., Applied physics letters **84** 3154(2004).