Self-assembled contacts to nanoparticles using metallic Ga droplets

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We demonstrate a pragmatic approach to forming electronic materials and devices, in which metal droplets serve as electrodes and their spacing is controlled spontaneously, *via* self-assembly, to allow tunneling contact with nanoparticles. We have fashioned devices consisting of droplets of molten metal (Ga). Ga is suspended in acidic solution. Ligand-stabilized Au nanoparticles in solution assemble on the metal surface, as shown by electro microscopy. Coated droplets which are then placed on a substrate and the solvent removed. Electron-transport measurements reveal the Coulomb blockade, in which current is suppressed below a tunable threshold voltage by the energy of charging individual nanoparticles. The threshold voltage for two different sizes of nanoparticles agrees with theory. Our approach provides a straightforward approach to creating nanoscale-precision contacts to nanoparticles and might lead to formation of a large number of microscopic devices from suspension.