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One-dimensional Metal Nanoparticle Necklace that Exhibits Coulomb Blockade at Room Temperature JENNIFER KANE, VIVEK MAHESHWARI, RAVI SARAF, University of Nebraska-Lincoln — One-dimensional (1D) nanostructures are attractive materials for fabricating electronic devices because the structure serves both as a device and circuit element to integrate external power source and extract the signal. Necklace of nanoparticles is a versatile avenue to build 1D nanostructures where the chemistry and diameter of the nanoparticle can be tailored. To date, nanoparticle necklaces have been self-assembled using isolated DNA chains, microorganisms, block copolymers, and polyelectrolyte films. However, the electrical conductivity of these structures has not been demonstrated. Here we present an approach to self-assemble a necklace of Au nanoparticles onto a chain of (flexible) polymer wherein the particles are then cemented with an inorganic material. The electrical properties of the cemented necklace show a coulomb blockade at room temperature. Interestingly, the blockade is over 1 V compared to 50 mV for a single particle. Furthermore, the blockade voltage blue-shifts as temperature decreases. We will present the fabrication process and explain the observations in terms of a simple model.

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