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Visualization of Percolation Path in a Two-Dimensional Array of Nanoparticle Exhibiting Room Temperature Single Electron Effect JASON KEE YANG ONG, JENNIFER KANE, RAVI SARAF, University of Nebraska-Lincoln — The conductance of a two-dimensional (2D) metal nanoparticle array is sensitive to local charging of nanoparticles at a single electron level, which leads to a threshold bias, VT caused by Coulomb blockade along the percolation path. As a result, the current flowing through the array of nanoparticles does not obey Ohm's-law. Generally, cryogenic temperatures are required to observe a robust VT. It is theorized that the charge centers posing the Coulomb blockade on the percolation path are fixed and independent of external bias. With the self-assembly of 1D nanoparticle necklaces into 2D array, it was possible to observe VT at room temperature due to the high topological constraint on the percolation path. Along with the success of nanofabrication of nanoparticle necklace array on a substrate using a combined technique of soft-lithography and electron beam writing, a single electron device with a single percolation pathway was tailored where the "opening" of the conduction path was directly visualized using field-emission Scanning Electron Microscopy (FESEM) as the Coulomb blockade due to the quenched charge distribution was progressively overcome.

Jason Kee Yang Ong
University of Nebraska-Lincoln

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