Abstract Submitted
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Measurements of Charge Transport in Arrays of Lead Selenide Nanocrystals[1] KENNETH MACLEAN, TAMAR MENTZEL, SCOTT GEYER, VENDA PORTER, MOUNGI BAWENDI, MARC KASTNER, Massachusetts Institute of Technology — We report electrical transport measurements of self-assembled arrays of PbSe nanocrystals (NC). NCs ∼6.2 nm in diameter are colloidally synthesized and drop cast onto an inverted field effect structure. The NCs self assemble into hexagonal close-packed arrays with ∼2 nm inter-particle spacing. The current is immeasurable in as deposited arrays. After annealing at 400K for ∼30 minutes, the arrays become less ordered and the inter-particle spacing decreases to ∼1 nm as evinced from TEM images and glancing incidence small angle x-ray scattering experiments. As a result of these changes, the conductance increases by more than 6 orders of magnitude. We measure the current in these devices as a function of source-drain voltage, gate voltage and temperature. We find that the temperature dependence of the conduction is strong at zero-bias and grows weaker with application of a source-drain bias. This implies that the conductance is thermally activated and the field serves to reduce the activation energy. We also find that the gate modulates the activation energy to conduction.

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