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Electron Transport in Arrays of Lead Selenide Nanocrystals[1]
TAMAR MENTZEL, VENDA PORTER, SCOTT GEYER, Massachusetts Institute of Technology, SOPHIE CHARPENTIER, Universite de Sherbrooke, MOUNGI BAWENDI, MARC KASTNER, Massachusetts Institute of Technology — We report on measurements of electron transport in self-assembled arrays of PbSe nanocrystals (NCs). NCs ∼8 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 ∼1.5 nm interdot spacing after annealing. The field-effect device enables us to measure the dependence of current on gate voltage (V_g) as well as source-drain voltage (V_{ds}). At high temperature we find that the conductance is exponentially dependent on both V_{ds} and temperature. At low temperature the conductance is still exponentially dependent on V_{ds}, but is independent of temperature indicating a tunneling mechanism. While the conductance is independent of V_g at high temperatures, it decreases with V_g at low temperature suggesting that holes are the dominant carriers.

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