

Dual gate control of Coulomb blockade oscillations in a double Si grain structure

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Controlled switching of Coulomb blockade oscillations was observed in nanocrystalline silicon point-contact transistors as a function of the voltages on dual lateral gates. The effects may be associated with electrostatic interactions between two nanoscale silicon grains in the channel. This phenomenon was investigated by using single-electron circuit simulation of a two parallel grain system with inter-grain capacitance and cross capacitance between the grains and the dual gates. We observed a change in the electron number of one grain due to charging of the other grain, causing bi-stable regions in the charge stability diagram. These effects depend not only the inter-grain capacitance but also on the cross capacitance.