

Abstract Submitted
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Analysis of Nanocluster-Based Single-Electron Transistors

MARIO ANCONA, RONALD RENDELL, Naval Research Laboratory — The possibility of making single-electron transistors (SETs) out of ultra-small metal nanoclusters is intriguing because of the potential for room temperature switching in structures that are 3-5nm in size. In this work the electrical properties that could be expected from such nanocluster-based SETs are explored using numerical simulation. The I-V characteristics are computed using the orthodox theory of Coulomb blockade with only one-electron processes considered and with the capacitances and tunneling resistances of the particular cluster configurations obtained by numerical simulations. These latter calculations must be performed in three dimensions because of the ultra-small radii of curvature involved. Of most interest is an examination of the effect of various structural imperfections on the I-V characteristics since this, in effect, sets the assembly tolerances that would have to be met for a viable nanocluster-based SET technology.

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