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Computationally Analyzing the Impact of Schottky Barriers on Current Characteristics of Carbon Nanotube Networks[1] SAMUEL PHILLIBER, ROBERTO ABRIL VALENZUELA, ALEJANDRO JIMENEZ, Department of Physics, California Polytechnic State University, San Luis Obispo, CA 93407, USA, H.P. NGUYEN, N. O. V. PLANK, School of Chemical and Physical Sciences, Victoria University of Wellington, Wellington 6021, New Zealand, C. A. MARLOW, Department of Physics, California Polytechnic State University, San Luis Obispo, CA 93407, USA — Nonlinear asymmetric current characteristics have been observed in field effect transistor device in which sparse networks of carbon nanotubes (CNTs) are the active layer. We propose this asymmetry is due to Schottky barriers formed at the junctions between metal (M) and semiconducting (S) carbon nanotubes within the network. To determine if this is the case we simulated random stick networks of low density and assigned sticks as either metal or semiconducting with the same ratio as the actual device networks. We then modeled the M-S junctions in the simulated network as ideal diodes. Using modified nodal analysis, we are able to simulate a potential difference across our simulated networks and determine the current. In this way we generated current voltage characteristics for multiple simulated networks of density and metallic ratio of the measure device. We observe current characteristics similar to what is seen experimentally indicating that the Schottky barriers at M-S junctions within CNT sparse networks have significant impact on the overall network properties.

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