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Electrical Current Characteristics of Simulated Carbon Nanotube Network Field Effect Transistors[1] JAMES RAJ, California Polytechnic State University , ROBERTO VALENZUELA, University of California, Santa Barbara, COLLEEN MARLOW, California Polytechnic State University — Carbon nanotube (CNT) network field effect transistors (FETs) offer a promising method for creating biosensors. Sensing occurs due to electrostatic gating which impacts the metallic-semiconducting (m-s) junctions in particular, and is heavily influenced by the morphology of the CNT network. Using a simulated random stick network, we assigned sticks to be either metallic (m) or semiconducting (s) with ratios and densities similar to actual devices and simulated electrostatic gating at each m-s junction in the network. For biosensing applications CNT FETs should have optimized sensitivity. However, it is not fully understood how a network's morphological parameters impact its overall network sensitivity. Using our simulation, we mapped sensitivity as the impact of gating each m-s junction within the network to the overall change in network current. This process was done for multiple simulated networks of varying tube densities. Our results showed that not all m-s junctions influence the network the same, and allowed us to determine which m-s junctions act. In addition, we verified that m-s junctions most influence the network response when the networks are of low density affirming that sparse networks have higher sensitivity.

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James Raj
California Polytechnic State University

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