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Conductance enhancement of carbon nanotubes through metallization CATERINA SOLDANO, LI CHEN, Department of Physics, Applied Physics and Astronomy, Rensselaer Polytechnic Institute, SWASTIK KAR, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, SAIKAT TALAPATRA, Department of Physics, University of Southern Illinois at Carbondale, ROBERT VAJTAI, Rensselaer Nanotechnology Center, Rensselaer Polytechnic Institute, SAROJ NAYAK, Department of Physics, Applied Physics and Astronomy, Rensselaer Polytechnic Institute, PULICKEL AJAYAN, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute — A novel method for building high-conductance device using carbon nanotubes is presented. The process involves a systematic, repeatable and controllable enhancement of the conductance using a rapid high-voltage cycling conducted in vacuum; this process leads to orders of magnitude drop in the two-terminal resistance. Electron microscopy analysis indicates that the high-bias cycling of nanotubes causes sufficient Joule heating for the platinum to migrate from the contact regions and decorate the outer surface of the nanotubes, giving rise to enhanced metallization. Pre- and post-metallization characterization is presented. It is believed that the conductance enhancement is due to a combination of a decrease in disorder density in the tube and an increase in the number of available channels for conductance. Those outcomes are investigated in the light of recently predicted theoretical models.

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