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Diameter dependence of carbon nanotube transistor performance
ZHIHONG CHEN, JOERG APPENZELLER, JOACHIM KNOCH, Institution fuer Schichten und Grenzflaechen, YU-MING LIN, PHAEDON AVOURIS, IBM T. J. Watson Research Center — As has been shown before, single wall carbon nanotube field-effect transistors (CNFETs) behave as Schottky barrier devices. The important question however is, what barrier height has to be overcome for current injection. So far, no detailed study exists that explains the impact of nanotube type and metal contacts in this context. Here we present the first statistical analysis of the dependence of on-current in a CNFET on the aforementioned two parameters. We show that a large data set of more than 100 devices can be consistently explained within a model that relates the on-current to a distinct Schottky barrier height which is determined quite reproducible by the nanotube diameter and the source/drain metal contact. Our study allows to identify the desired combination of tube diameter and type of metal that allows for optimum device performance of a CNFET.

Zhihong Chen

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