The structure and chemistry of CNTs in electrical nanodevices fabricated by beam deposition

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Abstract
Despite the progress of the last two decades [1], the characterization of carbon nanotubes (CNT) at the individual structure level remains a non-trivial task [2]. In regards to the fabrication of electrical nanodevices, questions remain on the effect of using beam deposition methods [3]. Amongst others, the extent of modification of the CNT lattice, as well as the deposition tail of the patterned electrodes, are issues that have attracted little attention. Further to this, the structural and chemical nature of the deposited contacts is a subject not fully understood.
Using a plasma-enhanced chemical vapor deposition reactor, a mat of vertically aligned multi-walled CNT (MWCNT) were grown (Fig. 1a). The nanotubes were then characterized with electron microscopy (Fig. 1b) and Raman spectroscopy. After dispersing them in solution, the nanotubes were drop-casted onto patterned Si/SiO_2 substrates and Pt electrodes deposited by either ion or electron beam methods (Fig. 1c). Besides characterizing the individual MWCNTs electrically, their structural and chemical integrities near the contact areas were analyzed. Assessment performed clearly showed beam deposition contamination of the nanotube interconnect along its length. Remarkably, there seems to be little mention of this critical issue in the literature.

References
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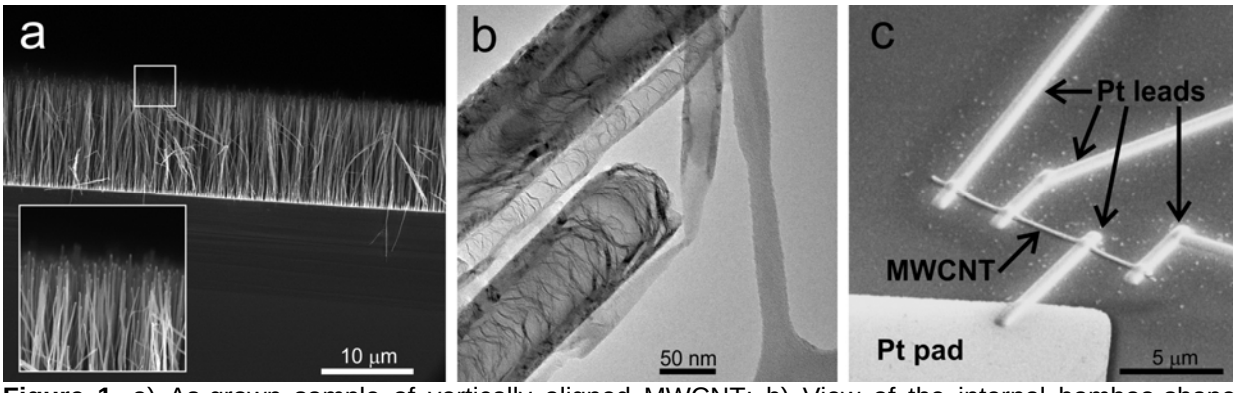

Figure 1. a) As-grown sample of vertically aligned MWCNT; b) View of the internal bamboo-shaped structure of the nanotubes; c) Four-terminal electrical device of an isolated nanotube.