NANO MICRO small

Supporting Information

"Textured" Network Devices: Overcoming Fundamental Limitations of Nanotube/Nanowire Network-based Devices**

Minbaek Lee[1], Meg Noah[2], June Park[3], Maeng-Je Seong[3], Young-Kyun Kwon,[2,4] and Seunghun Hong[1]**

[1] Department of Physics and Astronomy, Seoul National University, Seoul, 151-747 (Korea)
[2] Department of Physics and Applied Physics, University of Massachusetts, Lowell, MA 01854 (USA)
[3] Department of Physics, Chung-Ang University, Seoul, 156-756 (Korea)
[4] Department of Physics and Research Institute for Basic Sciences, Kyung Hee University, Seoul, 130-701 (Korea)

[*] E-mail: shong@phya.snu.ac.kr; ykkwon@khu.ac.kr

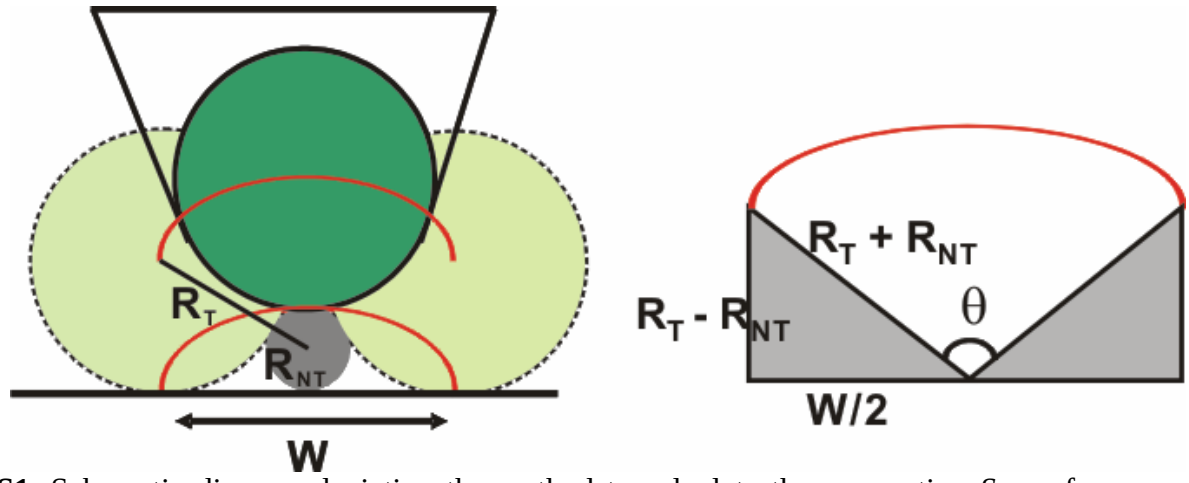

Figure S1. Schematic diagram depicting the method to calculate the crossection S_{CNT} of a single swCNT from AFM topography images to estimate the effective thickness t_{eff} in the simulation data. Here, *W*, L_{NT}, and R_{NT} are the measured *width*, *length*, and *radius* of individual swCNTs using AFM, respectively. On average, we measured *W ~ 20 nm*, L_{NT} ~ *650 nm*, and R_{NT} ~ *0.75 nm*. After some geometrical analysis, we can calculate the average volume (V_{CNT}) of a single swCNT as following.

$$W = 20nm = 2[(R_T + R_{NT})^2 - (R_T - R_{NT})^2]^{1/2}$$

$$R_{NT} = 0.75nm$$

$$\theta = \pi - 2\tan^{-1}(\frac{R_T - R_{NT}}{W/2})$$

$$S_{CNT} = \frac{1}{2}(R_{NT} + R_T)^2(\theta - \sin\theta)$$

$$V_{CNT} = \frac{1}{2}(R_{NT} + R_T)^2(\theta - \sin\theta) \times L_{NT} = 1.31 \times 10^{-5} um^3$$

The total volume of swCNTs in the simulation was estimated by multiplying V_{CNT} by the number of swCNT in channel. The effective thickness t_{eff} of swCNT films in simulation data was estimated by dividing total swCNT volume by total channel area.

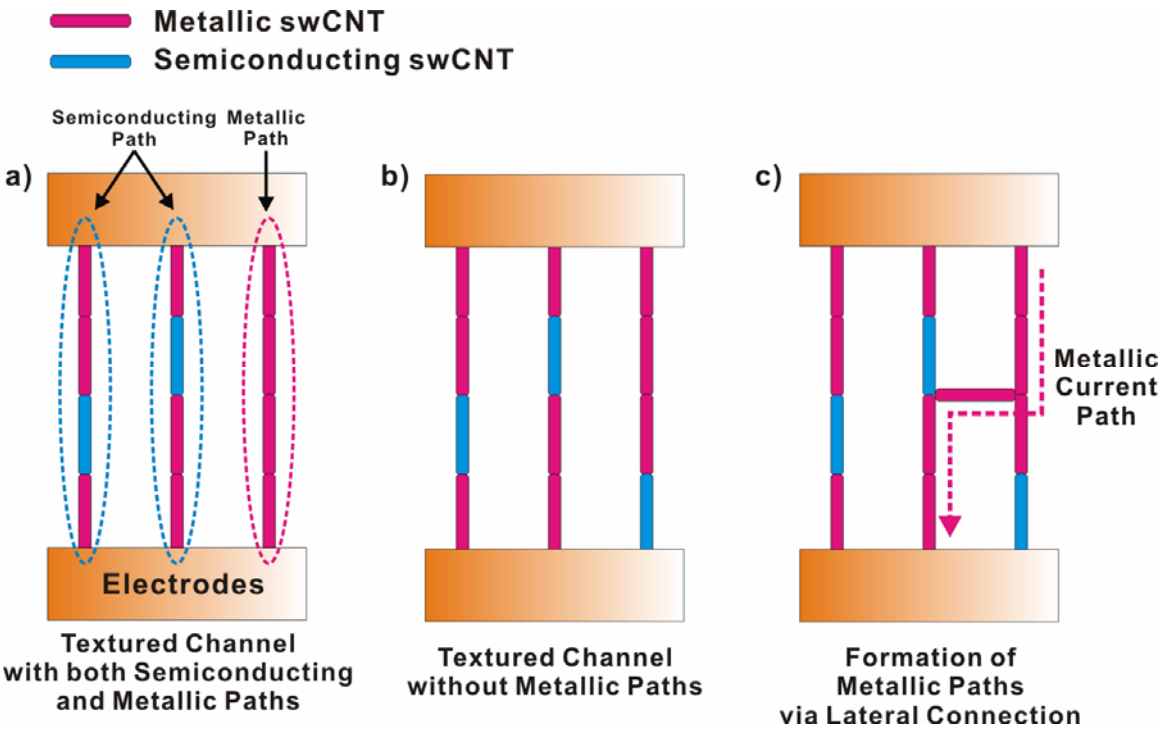

Figure S2. Schematic diagram explaining the formation of metallic paths via lateral connection. a) Textured channels with both semiconducting and metallic paths. A current path with any semiconducting swCNT should have semiconducting behavior. b) Textured channels comprised of only semiconducting paths. In this case, the device is expected to have semiconducting behavior with large on-off ratio. c) Lateral connection between individual paths increases the probability of metallic paths.