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Structural Control of Carbon Nanotube Networks for High-Performance Devices JUHUN PARK, MINBAEK LEE, HYUNGWOO LEE, SEUNGHUN HONG, Seoul Natoinal University, YOUNG-KYUN KWON, Kyung Hee University, MEG NOAH, University of Massachusetts, JUNE PARK, MAENG-JE SEONG, Chung-Ang University — In recent years, single walled carbon nanotube (swCNT)-based network devices were extensively studied for various practical applications such as transistors, sensors, etc. However, 'random' network-based devices have been suffering from various limitations such as poor on-off ratio, decreased mobility and conductivity with reduced channel width. Herein, we report a simple but efficient strategy to significantly improve the performance of network-based devices by controlling the 'network structures'. In this method, self-assembly monolayer was utilized to control the structures of CNT networks with desired connectivity. For example, as the channels of swCNT-based transistors became narrower, swCNTs aligned in the channels, which resulted in the enhancement of their on–off ratios. Significantly, the aligned network channels exhibited enhanced conductivity and mobility with reduced line width, which is a completely opposite behavior to randomly oriented swCNT networks or even conventional silicon-based devices. Furthermore, we could also improve the sensitivity of swCNT network-based sensors by aligning swCNTs in the networks.

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