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Wide Contact Structures for Low-noise Nano-channel Devices based on Carbon Nanotube Network HYUNGWOO LEE, MINBAEK LEE, SEON NAMGUNG, Department of Physics and Astronomy, Seoul National University, Seoul 151-747, Korea, SEUNGHUN HONG, Department of Physics and Astronomy; Department of Biophysics and Chemical Biology, Seoul National University, Seoul 151-747, Korea — We developed a wide-contact structure for low-noise devices based on carbon nanotube (CNT) networks. This wide-contact CNT network-based device has a dumbbell-shaped channel which is comprised of a narrow channel region and wide CNT/electrode contact regions. We showed that the wide-contact structure reduced $1/f$ noise which originated from CNT/electrode contact regions. We also systematically analyzed the noise characteristics of the structured CNT networks and established an empirical formula that can describe the noise behavior of CNT network-based devices including the effect of contact regions and CNT alignment. Interestingly, our noise analysis revealed that the noise amplitude of aligned CNT networks behaves quite differently compared with that of randomly-oriented CNT networks. These results would be an important guideline in designing low-noise nanoscale devices based on CNT networks for various applications such as a highly sensitive low-noise sensor.

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