Carbon-Nanotube-Based Integrated Circuits: From Field-Effect Transistors to All Carbon Nanotube Computers

It is widely accepted that the scaling of silicon-based integrated circuits which offers historical energy-efficiency benefits will come to an end in near future. Alternative technologies maintaining advances in computing power and energy efficiency are highly desirable. With the continuously rapid development of carbon-nanotube-based integrated circuits, it is anticipated that carbon-nanotube-based integrated circuits would be one of the most promising candidates. Here, we review the advances, and explore the potential of carbon-nanotube-based integrated circuits. We also examine the development of high purity semiconducting carbon nanotubes (s-SWCNTs) and CMOS field-effect transistors based on s-SWCNTs. Beyond the achievements and perspectives, the challenges in realizing carbon-nanotube-based large-scale integrated circuits and all carbon nanotube computers are also considered.