

Carbon nanotube field effect transistors: toward future nanoscale electronics

Felix Obite^{a,b}, Geoffrey Ijeomah^c and Joseph Stephen Bassi^a

^aFaculty Of Electrical Engineering, Universiti Teknologi Malaysia, Johor, Malaysia;

^bFaculty Of Physical Science, Department Of Physics, Ahmadu Bello University, Zaria, Nigeria;

^cFaculty Of Electrical & Electronics Engineering, Universiti Malaysia Pahang, Pahang, Malaysia

ABSTRACT

As the scaling down of silicon MOSFET is approaching its utmost limit, different materials are effectively being examined in order to keep the scaling trend. Among these, carbon nanotubes (CNTs) have emerged as one of the most extensively studied materials due to their excellent performance properties such as minimal short channel effects, high mobility, and high normalized drive currents. CNTs are the backbone of carbon nanotube field effect transistor, which is considered as the most preferred candidate for the replacement of silicon transistors. Despite their practical significance, a well-organized framework, and consistent review are still lacking. To this end, this paper presents an intensive review in order to define the state of the art in this field from a fresh and unifying viewpoint while elucidating fruitful insights into recent advances and future trends. In particular, we review material properties and structures. Specifically, we emphasize on the most relevant device fabrication and current modeling concepts. Furthermore, we distill key insights into recent advances and challenges that may sustain or expand future applications. The future research directions are also carefully analyzed.

KEYWORDS: Carbon nanotube; field effect transistors; nanoscale electronics; silicon mosfet

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