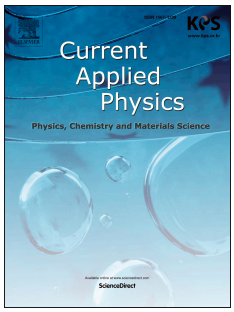
Accepted Manuscript



Ferroelectric polarization effect on hysteresis behaviors of single-walled carbon nanotube network field-effect transistors with lead zirconate-titanate gating

Yilin Sun, Dan Xie, Ruixuan Dai, Mengxing Sun, Weiwei Li, Tianling Ren

PII: S1567-1739(18)30003-8

DOI: 10.1016/j.cap.2018.01.003

Reference: CAP 4657

To appear in: *Current Applied Physics*

Received Date: 20 September 2017

Revised Date: 17 November 2017

Accepted Date: 7 January 2018

Please cite this article as: Y. Sun, D. Xie, R. Dai, M. Sun, W. Li, T. Ren, Ferroelectric polarization effect on hysteresis behaviors of single-walled carbon nanotube network field-effect transistors with lead zirconate-titanate gating, *Current Applied Physics* (2018), doi: 10.1016/j.cap.2018.01.003.

Ferroelectric Polarization Effect on Hysteresis Behaviors of Single-walled Carbon Nanotube Network Field-Effect Transistors with Lead Zirconate-Titanate Gating

Yilin Sun[a], Dan Xie[a]*, Ruixuan Dai[a], Mengxing Sun[a], Weiwei Li[a,b], Tianling Ren[a]

[a]Institute of Microelectronics, Tsinghua National Laboratory for Information Science and Technology (TNList), Tsinghua University, Beijing 100084, People's Republic of China

[b]College of Science, Air Force Engineering University, Xi' an, 710051, P. R. China

Abstract

We report the fabrication of single-walled carbon nanotube (SWCNT) network transistors by ferroelectric $Pb(Zr_{0.4}Ti_{0.6})O_3$ (PZT) bottom-gating and investigate the polarization effects of PZT on the transport properties of the transistor device. Our devices exhibit typical p-channel transistor characteristics and a large hysteresis loop with high ON/OFF current ratio and large ON current as well as memory window (MW) measured up to 5.2V. The origin of clockwise hysteresis is attributed to ferroelectric polarization modulated charge trapping/de-trapping process in the interface states between SWCNT networks and PZT. The retention time about 10^4s with two high stable current states preliminarily demonstrates great potential for future non-volatile memory applications based on such SWCNT/PZT hybrid systems.

Keywords: Ferroelectric polarization, hysteresis, carbon nanotubes, transistors, charge trapping/de-trapping process

* **Corresponding Author:** xiedan@tsinghua.edu.cn