NF-P018

Understanding of Growth Habits of VO_2 Film on Graphene and Their Effects on Metal to Insulator Transition$_2$

Jaehoon Yang[1], Keunsoo Kim[2], Arang Jang[1], Hyoung Woo Yang[1], Dae Joon Kang[1]

[1]BK 21 Physics Research Division, Department of Energy Science, Institute of Basic Science and SKKU Advanced Institute of Nanotechnology, Sungkyunkwan University, Suwon 440-746, Republic of Korea,
[2]Department of Physics and Graphene Research Institute, Sejong University, Seoul 143-747, Republic of Korea

Growth of metal oxides on graphene may lead to a better understanding of delicate effects of their growth habits on their underlying physics. The vanadium dioxide (VO_2) is well known for its metal-to-insulator transition accompanied by a reversible first order structural phase transition at 340 K. This transition makes VO_2 a potentially useful material for applications in electrical and optical devices. We report a successful growth of VO_2 nanostructures on a graphene substrate via a vapor-solid transport route. As-grown VO_2 nanostructures on graphene were systematically characterized by field emission scanning electron microscopy, x-ray diffraction, Raman spectroscopy, FT-IR spectroscopy and high resolution transmission electron microscopy. These results indicate that the strain between VO_2 and graphene layers may be easily controlled by the number of underlying graphene layer. We also found that the strain in-between VO_2 and graphene layer affected its metal-to-insulator transition characteristics. This study demonstrates a new way for synthesizing VO_2 in a desired phase on the transparent conducting graphene substrate and an easy pathway for controlling metal-to-insulator phase transition via strain.

Keywords: VO_2, Metal-to-insulator transition, Strain-controlled phase