NT-P017

Tunable Metal-Insulator Phase Transition in VO_2 Nanowires

Won-Kyung Seong, Ji-Yeong Lee, Myoung-Woon Moon, Kwang-Ryeol Lee

Institute for Multi-disciplinary Convergence of Materials, Korea Institute of Science and Technology, Seoul 136-791, Korea

Understanding the thermodynamics and structural transformation during the Metal-Insulator Transition (MIT) is critical to better understand the underlying physical origin of phase transition in the vanadiumdioxide (VO_2). Here, through the temperature-dependent in-situ high resolution-transmission electron microscopy (HR-TEM), and systematic electrical transport study, we have shown that the tunable MIT transition of VO_2 nanowires is strongly affected by interplay between strain and domain nucleation by ion beam irradiation. Surprsingly, we have also observed that the VO_2 rutile (R) metallic phase could form directly in a strain-induced metastable monoclinic (M2) phase. These insights open the door toward more systematic approaches to synthesis for VO_2 nanostructures in desired phase and to use for applications including ultrafast optical switching, smart window, metamaterial, resistance RAM and synapse devices.

Keywords: phase transition, VO_2, TEM