conferenceseries.com

J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C4-077

Novel fabrication of ZnO/CuO core-shell nanowires hetero-junction and their optoelectronic properties

Muhammad Arif Khan[1,2]
[1]Universiti Teknologi Malaysia, Malaysia
[2]International Islamic University, Pakistan

This research investigates the novel fabrication and controlled growth of vertically aligned ZnO/CuO core-shell hetero-junction Nanowires (NWs) formation by vapor deposition and oxidation approach. ZnO/CuO hetero-structure nanowires were grown on n-type Si substrate using modified Thermal Chemical Vapor Deposition (TCVD) assisted by sputtering deposition followed by thermal oxidation under controlled growth conditions. The effects of fabrication parameters on structure, growth mechanism, optical and electrical properties of the ZnO/CuO core-shell hetero-junction were thoroughly investigated. Structural characterization by Field Emission Scanning Electron Microscope (FESEM), High Resolution Transmission Electron Microscope (HR-TEM), Scanning Transmission Electron Microscope (STEM), X-ray Photoelectron Spectroscope (XPS), X-ray Diffractometer (XRD) and Energy Dispersive X-ray (EDX) reveals that a highly pure crystalline ZnO core and polycrystalline CuO shell were successfully fabricated in which ZnO and CuO are of hexagonal wurtzite and monoclinic structures, respectively. The growth of ZnO nanowires is along the c-axis direction and the nanowires have relatively smooth surfaces with diameters in the range of 35-45 nm and lengths in the range of 700-1300 nm. The CuO nano-shell with thickness of around 8-10 nm is constructed of nano-crystals with sizes in the range of 3-10 nm. The optical, electrical and band offset properties at hetero-interface of core-shell hetero-junction nanowires were also discussed in details. The research of this study can provide new pathways and presents a simple approach for the fabrication of vertically aligned n-ZnO/p-CuO core-shell hetero-junction NWs for the applications such as solar energy conversion and advanced nano-optoelectronic devices.

akmuhammad6@live.utm.my