Abstract

Electrical and Gas Sensing Properties of $p$-Type Co$_3$O$_4$ Loaded $n$-Type TiO$_2$ Nanotubes Heterostructures †

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$p$-type Co$_3$O$_4$ particles loaded onto $n$-type TiO$_2$ nanotubes (NTs) with controlled Co$_3$O$_4$ density were synthesized using a two-step electrochemical deposition procedure. Morphology and structure of the fabricated samples were characterized by Scanning Electron Microscopy equipped with Energy Dispersive X-ray Spectroscopy and the X-ray Diffraction method. The effect of loading density on the electrical and gas sensing properties of the loaded $n$-type TiO$_2$ NTs was investigated. $C$-$V$ and $I$-$V$ characteristics were obtained and the heterojunction barrier height was determined. Sensor properties of hydrogen (H$_2$), NO$_2$ and VOCs with varying operation temperatures were measured. The results show that Co$_3$O$_4$ particle density on the surface of TiO$_2$ NTs directly affects the sensor performance such as selectivity and sensor response, even at low operation temperatures.

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