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Title of the lecture: Nanosensors on a single semiconducting oxide nanowire

Abstract

The room-temperature nanosensors are demanded from different fields, such as rapid detection of hazardous, explosive and nocive gases, compounds and various risky nanomaterials. Due to their huge surface-to-volume ratio and high crystallinity, the one-dimensional (1-D) semiconducting oxide nanostructures, such as nanowires have attracted great interest toward their integration in modern sensing micro-devices and nano-devices. In this work, we investigated performances of individual Pd-, Au-nanoparticles functionalized zinc oxide nanowires integrated into nanosensor devices using dual beam focused ion beam/scanning electron microscopy (FIB/SEM) and investigated them as gas nanosensors at room temperature. Important parameters as length, diameter and relative humidity (RH) on the gas sensing properties were studied in detail. The obtained results demonstrate that thin Au/ZnO nanowire (radius of 65 nm) have a gas response of *about* 8 to 100 ppm of H₂ gas which is higher compared to ~ 1.2 for those with a radius of 130 nm. The corresponding gas sensing mechanisms are tentatively proposed for each type of nanodevices. The proposed nanosensors are essential for next understanding the role of noble metal nanoclusters on semiconducting oxide nanowires and contribute for a design of modern room-temperature gas nanosensors.

Biography

Oleg Lupan is a Professor and research scientist in solid state electronics and nanoelectronics at Technical University of Moldova (TUM). He received an AvH Humboldt Fellow for experienced researchers at Kiel University, CAU, Germany, period 2013–2015. He started a new research group “Nanotechnology and nanosensors” at TUM in 2015. He received his M.S. in microelectronics and semiconductor devices from the Technical University of Moldova (TUM) in 1993. He received his Ph.D. from the Institute of Applied Physics, Academy of Sciences of Moldova (ASM) in 2005. His post-doctorate research activities were carried out at the French CNRS, Paris, France, full position, and the University of Central Florida, USA. He received his doctor habilitate degree (Dr. Hab. Eng.) in solid state electronics, microelectronics, and nanoelectronics from the Institute of Electronic Engineering and Nanotechnologies of ASM in 2011. His post-habilitation activities were performed at the University of Paris-PSL-IRCP-ENSCP-CNRS, Paris, France, and the Kiel University, CAU, Germany. Prof. Lupan has made original and innovative contributions to the designing, fabrication, characterization and understanding of performances of semiconducting oxide films based sensors and individual nanowire nanosensors. His current research interests include sensors, nanosensors, optoelectronic devices, LEDs, semiconducting oxides, nanotechnologies, and nanodevices.