PROGRAM

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MO Microelectronics and Optoelectronics, Nanosciences and Nanotechnologies / Mikroelektronika i optoelektronika, nanonauke i nanotehnologije

Session MOI1: Microelectronics, Microsystems, Nanotechnologies and Optoelectronics

Thursday, June, 14th, 08:00 – 10:30, Hall 1

Chairs: Ninoslav Stojadinović, Serbian Academy of Sciences and Arts - branch in Niš and Faculty of Electronic Engineering, University of Niš, Serbia;

Dana Vasiljević Radović, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

MOI1.1

DESIGN AND CHARACTERIZATION OF THERMOELECTRIC ENERGY HARVESTING SYSTEMS FOR WIRELESS SENSOR NODES (Invited paper)

Zoran Prijić, Faculty of Electronic Engineering, University of Niš, Serbia

Ljubomir Vračar, Faculty of Electronic Engineering, University of Niš, Serbia

Aneta Prijić, Faculty of Electronic Engineering, University of Niš, Serbia

As a process of obtaining electrical energy by conversion from the surrounding sources, energy harvesting is convenient for powering wireless sensor nodes. Operation of the nodes requires reliable systems for conversion, storage and management of the harvested energy. This paper reviews some of the most common design principles and characterization methods for the energy harvesting systems based on the small thermoelectric generators. Techniques for solving cold boot issues and achieving prolonged autonomy of the nodes are highlighted. Illustrative design examples of the nodes, based on the commercially available (off-the-shelf) devices, are presented.

MOI1.2

DEVICE SIMULATIONS OF OFF-STATE BREAKDOWN VOLTAGE IN THE RF SILICON-BASED LDMOS POWER TRANSISTORS

Vladimir Milovanović, Faculty of Engineering, University of Kragujevac, Serbia

Darko Tasovac, NovelIC Microsystems, Serbia

Past decades saw a tremendous incline in the performance of laterally diffused metal oxide semiconductor (LDMOS) field-effect transistors (FETs), putting them as the leading radio-frequency (RF) power technology in several application areas, like for example cellular infrastructure. One of the key parameters of LDMOS devices is certainly the breakdown voltage. Careful engineering of the transistor is necessary to optimize various parameters and achieve good compromise between number of key quantities. Device designers use technology computer-aided design simulation tools to reduce development time and to make their designs competitive. This paper deals with simulations of off-state avalanche breakdown in LDMOS transistors. Two ways of estimating the breakdown voltage are identified and applied in simulations of a typical LDMOS device. Analysis of simulation results confirms that the two methods are practically equivalent.

MOI1.3

STEADY-STATE ANALYSIS OF STOCHASTIC TIME RESPONSE OF CHEMICAL AND BIOLOGICAL MICROFLUIDIC SENSORS

Ivana Jokić, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

Zoran Djurić, Serbian Academy of Sciences and Arts, Institute of Technical Sciences of SASA, Serbia

Katarina Radulović, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

Miloš Frantlović, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

Predrag Krstajić, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

Katarina Cvetanović Zobenica, Institute of Chemistry, Technology and Metallurgy – Center of Microelectronic Technologies, University of Belgrade, Serbia

In this paper we first give a short review of two stochastic models describing both the expected value and variance of the random number of adsorbed particles in microfluidic adsorption-based chemical and biological sensors. One model takes into account the influence of coupling of stochastic adsorption-desorption processes and mass transfer on the change of the number of adsorbed particles, while the other neglects the influence of mass transfer. Subsequently, by using the two models, we perform the analysis of the expected value and variance, as well as the sensor's signal-to-noise ratio, after reaching the steady state of all transient processes. We compare the results obtained by using the different models, and determine conditions for their application. We estimate the influences of the sensing surface area and the concentration of target particles on statistical parameters of sensor response and signal-to-noise ratio, considering the cases where mass transfer is significant, and those where it is not. We particularly analyze the mass transfer influence on the expected value, variance and signal-to-noise ratio. Such analysis does not exist in the available literature. The presented analysis yields new knowledge about the stochastic response of adsorption-based sensors, and it is significant for their optimization in order to achieve reliable analyte detection and improved sensing performance.

MOI1.4

DIRECT LASER WRITING OF MICRO-STRUCTURES IN VECTOR MODE FOR CHEMICAL SENSORS

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Chemical sensors are the key part of the sensing platforms. They have different operating principles, but most of them are based on microstructures formed on the surface of the chip. In this paper we present technique for obtaining micro sized structures for the use in two different types of the chemical sensors. One type of the sensor is based on the electrical conductivity alteration in Au thin-film while the other is based on the optical properties of periodic metallic structures utilizing plasmonic effects. Technique presented here is based on the laser writing on the photosensitive material in "vector mode" where only continuous lines could be directly written. Width of the written lines is modified by alternating technique parameters. Narrowest obtained lines have width of about 1 μm with clearance of about 3 μm

MOI1.5

TWO TYPES OF INTEGRATED HEATERS FOR SYNTHESIS OF TIO_2 NANOPARTICLES IN MICROREACTORS