From ZnO-based 1D and 2D nanostructured materials to devices

Viorica MUŞAT[1], Laurentiu FRANGU[2], Nicolae ŢIGĂU[1], Rodrigo Martins[3], Elvira FORTUNATO[3]

[1]Centre of Nanostructures and Functional Materials-CNMF, *Dunărea de Jos* University of Galati, Romania
[2]Department of Electronics and Telecommunication, *Dunărea de Jos* University of Galati, Romania
[3]Department of Materials Science, CENIMAT/I3N, FCT-UNL, Portugal

1D and 2D semiconductive metal oxide nanostructures stand out by high crystallinity single crystal structure, high electrical carrier mobility compared with bulk or even thin-film materials and the possibility to manipulate band gap energy and control the properties by adjusting their morphology (shape and size), all these properties leading to a broad range of high-technological applications (field effect transistor, UV detector, gas sensors, light emitting diodes, solar cells, electrical batteries, low powered electrical devices).

The paper discusses some functional properties that enable 1D and 2D nanostructured ZnO-based layers grown by hydrothermal method on glass or silicon substrates to be used in electronic, optoelectronic and sensor applications. The paper shows the functional characterization of ZnO and Al:ZnO 1D nanostructures grown in preselected areas for direct integration into gas sensors, UV photodetection devices, photovoltaic cells. Potential applications of 2D nanostructured Al:ZnO layers as voltage rectifier or signal detector for circuits powered from low voltage sources or as voltage surge protection device is presented.

Keywords: 1D and 2D nanostructures, (Al):ZnO, solution-based synthesis, morphology and crystallinity, optical properties, electrical properties, gas sensing, photodetection device, photovoltaic cells, voltage rectifier/signal detector for low powered circuits, voltage surge protection device