

I-V characterization of tin oxide nanocrystalline films for optical fiber sensors

R. Viter¹, V. Smyntyna¹, Yu. Nitsuk¹, M. Pisco², M. Consales², S. Campopiano², M. Giordano³,
A. Cusano², A. Cutolo².

¹*Department of Experimental Physics, Odessa National University, 42, Pastera str., 65026, Odessa, Ukraine, viter_r@mail.ru; phone +38-0676639327, fax: +380-48 7233515*

²*Optoelectronic Division-Department of Engineering, University of Sannio, 107, Corso Garibaldi, 82100, Benevento, Italy, a.cusano@unisannio.it; phone 0039-0824305846; fax 0039-0824305840*

³*Institute for Composite and Biomedical Materials, CNR, Naples, Italy*

Tin oxide SnO₂ is well known as material for gas sensors. Tin oxide is chemically stable for different aggressive chemical pollutants and doesn't change its structure under high temperatures [1]. This good features let to fabricate many different sensors, based on tin oxide to different gases. Also tin oxide thin films have been successfully used as transparent conducting electrodes in optical devices [1]. Such properties allow thinking about combination of optical and sensitive peculiarities of tin oxide for new applications.

Single optical fiber (SOF) chemical sensors is a new trend in sensing technologies [2]. The most important advantages of such sensors are small size, indifference to external electromagnetic field influence and possibility to create sensing systems, consisting of a lot of sensing elements. Integration of novel optoelectronic technologies and semiconductor sensitive materials seems to be prospective to fabricate and develop new sensors of gas and liquids. In our previous works we demonstrated possibility of deposition tin oxide layer on tip of optical fiber and

The one important thing is to build numerical model of optical fiber sensor is to determine all structural, electrical and optical parameters of sensitive metal oxide layer. By means of Drude's and Lorentz's models which give relations between electronic and optical parameters it is prospective to perform further calculation of optical model of metal oxide optical fiber sensors. In this work experimental results of investigation of tin oxide nanocrystalline films optical properties are reported. Current-voltage and temperature dependence of current have been performed. Mechanism of charge transfer has been discussed.

References

1. Viter R., Smyntyna V., Evtushenko N. Structural properties of nanocrystalline tin dioxide films deposited by electrostatic, spray pyrolysis method // *Photoelectronics*.- 2005.- Vol. 15.- p.54-57.
2. M. Pisco, M. Consales, R. Viter, V. Smyntyna, S. Campopiano, M. Giordano, A. Cusano, A. Cutolo. Novel SnO₂ based optical sensor for detection of low ammonia concentrations in water at room temperatures // *Intern. Sc. J. Semiconductor Physics, Quantum Electronics and Optoelectronics*.- 2005.- Vol. 8.- p.95-99.