Influence of thin oxid layer to photoacoustic signal of nano-mechanical structures

К.Lj Đorđevic1\*, S.P. Galović1, M.A. Dragaš2,3,D.K. Marekushev4, D.D. Markushev4

*1„VINČA” Institute of Nuclear Sciences, National Institute of the Republic of Serbia,*

*University of Belgrade, Belgrade, Serbia*

*2 Faculty of Philosophy, University of East Sarajevo, Pale, Bosnia and Herzegovina*

*3 Faculty of Physics, University of Belgrade, Serbia*

*4 Institute of Physics Belgrade, National Institute of the Republic of Serbia,*

*University of Belgrade, Belgrade (Zemun), Serbia;*

**\*** Correspondence: [katarina.djordjevic@vin.bg.ac.rs](mailto:katarina.djordjevic@vin.bg.ac.rs)

Nano mechanical structures (NEMS) are being developed for application in pressure and temperature sensors. They consist of a very thin oxide layer on a silicon wafer. This layer is placed to improve their sensitivity to pressure changes. In this paper, it was investigated how much this layer affects the physical properties of such structures. In the research, the photoacoustic gas microphone experimental measurement method was applied and neural networks were developed for solving the inverse photoacoustic problem. The obtained results show that controlling the thickness of the oxide layer can be done by engineering the thermal elastic and optical properties of the NEMS.

[1] Djordjević K.Lj., Markushev D.K., Popović M.N., Nesić M.N., Galović S.P., Lukić D.V., Markushev D.D., Photoacoustic Characterization of TiO2 Thin-Films Deposited on Silicon Substrate Using Neural Networks, Materials 2023, 16(7), 2865; https://doi.org/10.3390/ma16072865

[2] Djordjevic, К. L., Galovic, S. P., Jordovic-Pavlovic, M. I., Nesic, M. V., Popovic, M. N., Cojbasic, Z. M., Markushev, D. D. Photoacoustic optical semiconductor characterization based on machine learning and reverse-back procedure. Optical and Quantum Electronics, 2020, 52(5). doi:10.1007/s11082-020-02373-x

[3] Todorović D.M.; Rabasović M.D.; Markushev D.D. Photoacoustic elastic bending in thin film—Substrate system Journal of Applied Physics. 2013, 114, 213510(11) https://doi.org/10.1063/1.4839835