Nanocomposites and nanomaterials

Thermal conductivity study of mesoporous silicon with piezoelectric photoacoustic technique

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In nowadays industry degree of integration and miniaturization of electronic and photonic components is continuously increasing. Therefore, the issues associated with the optimization of thermal evacuation from the active zone became crucial. Thus, the information about thermal properties of low-dimensional structures are essential for reliability and stability of the devices based on it. Porous silicon is an interesting candidate for as a constitute component in the different systems [1]. In particular, since its low thermal conductivity, it can be applied as a thermal insulator. However, one should note that the formation of this material is often stochastic and depends on huge number of different factors. Thus, the development of the method of the in-situ diagnostic of porous silicon is significant.

During report we will present the results of thermal conductivity study of porous silicon with piezoelectric photoacoustic technique. The porous silicon samples were prepared by electrochemical etching of monocrystalline silicon wafers with different anodization current densities to perform different porosities. The amplitude-frequency and phase-frequency dependencies of the photoacoustic response were measured with piezoelectric technique described previously in [2]. The experimental obtained data was fitted with the results of simulation based on the proposed model. This allows us evaluate the thermal conductivity of the porous silicon samples with different porosity.

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2. *Isaiev M., Andrusenko D., Tytarenko A., Kuzmich A., Lysenko* V., *Burbelo R.* Photoacoustic Signal Formation in Heterogeneous Multilayer Systems with Piezoelectric Detection // Int. J. Thermophys.-2014.-**35**, N 12.-P. 2341-2351.