NANOCRYSTALLINE ZINC OXIDE TETRAPODS WITH ENHANCED ANTIBACTERIAL ACTIVITY

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Inorganic nanocrystals with their unique physical, chemical, and biological characteristics are the subject of intense research by many laboratories around the world. Nanoscale semiconducting oxides, including zinc oxide (ZnO) exhibit the excellent differ than larger or the massive materials, electromagnetic, optical and catalytic properties. These facts motivated the search for more effective ways to synthesize such nanoparticles with controlled shape and size. An important factor in the development of new nanotechnology is the purity of the product, on the one hand, and on the other hand, the cost of its fabrication. One of the perspective directions of use of nanostructured oxides and zinc oxide, especially associated with nanomedicine is antibacterial action. [1-2]. Uncontrolled usage of antibiotics significantly increases the number of multi-resistance strains of pathogenic microorganisms [3]. The metallic silver and its oxides, in the form of nanoparticles, are traditionally used as antiseptics and antibacterial drugs [4]. Toxic effects of silver and a cost of getting the drugs is a reason to encourage the search for alternative means. Single studies in this field indicate the effectiveness of ZnO nanoparticles as antibacterial agents [5]. In particular, studies using two bacteria (*E. coli* and *S. aureus*) show that the unique antibacterial properties of ZnO particles due largely to their sizes (large specific surface area). Architecture of nanoparticles is also important, if not the most important factor influencing their versatility [2,6]. It was recently investigated that the so-called zinc oxide tetrapods, obtained using the technology of transport flame synthesis (FTS), is quite effective for use as photocatalysers, UV detectors and gas sensors [2,6-7]. Previous studies of similar objects, held by our common groups, show the prospects of the use of such structures as effective antibacterial agents. The purpose of this research is the development of ZnO tetrapods structures with different morphology, nanoscopic facets and structure of spatial grids for biomaterial with antibacterial properties. In this sense, the so-called 3D freestanding micro- and nano-structures of different materials can meet our requirements and, therefore, be suitable for several applications, as they can easily be adapted to set goals using a variable-type substrates [2,6]. The first study of antibacterial properties of ZnO tetrapods with nanoscopic facets against both Gram-positive (*St. aureus, St. pyogenes*) and Gram-negative (*E. coli, K. pneumonia, P aeruginosa*) bacteria with different efficiencies demonstrated the prospects of the use of these material as antimicrobial agents.

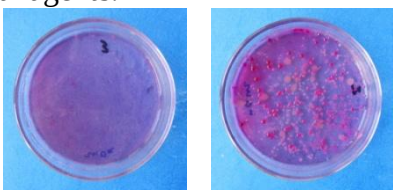

Figure 1. Bacterial (*E. coli*) sensitivity against ZnOa-set (left) and ZnO4-set (right) tetrapods (20 mg/ml) with 100% and 27% reduction of the bacteria viability correspondently.

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