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Antimicrobial activity vs. shape of zinc oxide nanoparticles

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Abstract

This paper is concerned with studying antibacterial properties of high-dispersed zinc oxide obtained using sol-gel technology, against gram-negative bacteria *Pseudomonas aeruginosa*. The sol-gel technology is deemed to be preferential due to possible creation of disperse systems with targeted properties, i.e. concentration, shape and size of particles. Electrolyte of zinc nitrate has been selected as peptizing agent for preparation of sols. It has been established that synthesized sols consist of particles of various shapes depending on the precipitator chosen (aqua ammonia, hexamethylenamine, sodium carbonate). X-raying has shown that, regardless of the production process, sol particles form the wurtzite modification of zinc oxide. The basic colloid-chemical properties of all sols have been determined using dynamic light scattering, scanning electron microscopy, conductivity measurement and macro electrophoresis methods. Microbiological investigations have been conducted using standard procedures (Koch's plate count method, pour plate method, sequential decimal dilution to determine the bacteria titration standard). The scientific novelty of the study consists in defining the impact of the zinc oxide particle shape on its antimicrobial properties. At the moment, there are no publications giving information about microorganisms capable to resist the impact of the zinc oxide particles. It has been found out that, rod-shaped zinc oxide particles feature the utmost antimicrobial activity. The obtained investigation results can be used to make the most effective compositions of various purpose, antibacterial materials, as well as to design and develop new drugs based on metal nanoparticles against infections of microorganisms.

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