

Nanochemistry and Nanobiotechnology

Antibacterial and antifungal activity of cotton fabrics, impregnated with silver and copper nanoparticles

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Nanosized silver and copper particles are known for its antibacterial properties against a wide range of pathogenic bacteria. Bactericidal action of nanosized silver and copper depends on their size, shape, and nature of stabilizer that protects nanoparticles (NPs) from oxidation. In the case of NPs deposition on the surface of inorganic or organic carrier, which may be dispersed silica, polymers, colloids or textile tissue, the surface and chemical nature of the carriers directly affects the release of the active atoms and / or metal ions into the environment and kinetics of bactericidal action. The introduction of metal NPs in the textile is promising for obtaining high dispersive bactericidal agents that strongly held in the structure of textiles, not aggregate and do not require special efforts in the production and use. In this paper an original method of doping of silver and bimetallic NPs Ag / Cu in cotton tissues by impregnation of aqueous solutions of metal salts followed by drying and heat treatment of the cotton in the certain mode. Obtained materials have been characterized by methods of optical spectroscopy and X-ray diffraction analysis indicated the formation of crystalline silver and bimetallic NPs compositewith corresponding optical absorption spectra. High antimicrobial properties of tissues with Ag nanoparticles and Ag / Cu confirmed in experiments with a wide range of bacteria and fungi: E. Coli, E.aerogenes, P. mirabilis, K.pneumonia, C. albicans and others. Materials containing silver NPs exhibit high antiseptic properties. The highest antibacterial and antifungal activity showed textile materials doped with bimetallic composite Ag / Cu. Bactericidal tissues do not decrease their activity after washing. The method of production of such material is extremely rapid, cost-effective and convenient.