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PREPARATION OF CELLULOSE MATERIALS WITH ANTIMICROBIAL PROPERTIES BASED ON COPPER AND ZINC

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Recently textile materials and products are developed that provide security and improve the quality of human life. Creation of a safe range of fabrics with antimicrobial properties is an urgent issue.

At the moment, different techniques, photonic technologies, laser processing, plasma discharge are used in order to give special properties to the different origin fibers. These methods offer great possibilities for modifying fibers and textile, but a significant disadvantage is the high outlay, as such processes require special expensive equipment and have specific limitations. Based on an analysis of literature data, the sol-gel technology that allows to create repeatable, controlled and ordered structure can be considered as a promising method of obtaining the necessary technically valuable properties.

The sol-gel synthesis involves the formation of a sol followed by passing it into a gel. A sol is a suspension of solid particles in the size range from 1 nm to 1 micron, which can be prepared by hydrolysis and partial condensation of alkoxides precursors and silicates. The conditions used for the preparation of sols solvent, pH, temperature, concentration, the sol concentration, determine the development of particles, as well as their resolution. The hydrolysis can be carried out both in acidic and alkaline medium. There are also non-aqueous sol-gel.

In this paper we consider the procedure of the synthesis of protective SiO_2 coating through the sol-gel method, study physical and mechanical properties and antimicrobial properties of the obtained materials.

According to the results of electron scanning microscopy the elemental composition of two film-forming solutions were investigated. The first solution contained zinc acetate SiK-6,21%, ZnK-3,98%. The second solution contained copper acetate SiK-14,57%, CuK-16,08%. The obtained data show that our technology provides consolidating of zinc acetate and copper nanoparticles on the surface of cellulose fabric fibers.

Cultures of *S. aureus*, *E. coli*, *C. albicans*, *Ps. aeruginosa* were used as the test microorganisms. The analysis of the results show that the dressed samples possess antimicrobial properties, efficiency after the zinc acetate treatment was: *S. aureus* - 80%, *E. coli* - 71,3%, *C. albicans* - 79,2%, *Ps. aeruginosa* - 25,9%. The efficacy after copper acetate treatment was: *S. aureus* - 90,7%, *E. coli*- 80,0%, *C. albicans* - 86,0%, *Ps. aeruginosa* - 27,8%. According to the obtained data, we can draw conclusion about the high antimicrobial properties of the treated samples. Moreover, the best indicators of antimicrobial activity have been revealed after the acetate treatment with.

During the study on determination of the breaking load, it was found that the impregnation compound does not affect the breaking indices of the study samples vary within, breaking load of the untreated sample is 209.1 N, breaking load of the treated sample is 212.6 N. The porosity indicators remain virtually unchanged compared to the untreated cloth 170.9 $dm^3/m^2 \cdot s$, treated sample is 168,7 $dm^3/m^2 \cdot s$. The porosity of the cotton fabric treated through the proposed composition comply with regulatory requirements for this group of fabrics.