

to untreated samples, as evidenced by the growth of this indicator to 85%.

2. Water-repellent properties of cotton fabric treated with this composition increase by 15% compared to the original sample.

3. Coefficients of air permeability of the fabric treated with the proposed composition are reduced by 4%.

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DEVELOPMENT OF A POLYMER COMPOSITION TO PROTECT TEXTILE MATERIAL FROM BIO-DAMAGE

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The article presents a method for increasing the microbiological resistance of textile materials under operating conditions. Studies were conducted using polyvinyl alcohol (PVA), maleic acid (MA) and a solution of silver ions (SI). This fabric was treated with an dressing composition to improve the antimicrobial properties of the textile material. In addition, research has been conducted to identify the physical and mechanical properties of samples treated with different concentrations of dressing composition, to prevent negative effects on the protection function and practicality of wear. The study revealed the most optimal concentrations of the composition components: PVA – 8 g/l, SI – 50 ml/l, MA – 5 g/l.

Keywords: composition, fabric Premier Standard 210, microbiological tests, antimicrobial properties, fungi.

ТОҚЫМА МАТЕРИАЛЫН БИО ЗАҚЫМДАЛУДАН ҚОРҒАУ ҮШІН ПОЛИМЕРЛІ КОМПОЗИЦИЯНЫ ӨЗІРЛЕУ

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Мақалада пайдалану жағдайында тоқыма материалдарының микробиологиялық беріктігін арттыру әдісі ұсынылған. Поливинил спиртін (ПВС), малеин қышқылын (МК) және кү-

міс иондарының (КИ) ерітіндісін пайдалана отырып зерттеулер жүргізілді. Бұл мата тоқыма материалының микробқа қарсы қасиеттерін жақсарту үшін таңдалған реагенттердің негізінде аппретпен өңделген. Бұдан басқа, аппреттің әртүрлі концентрацияларымен өңделген үлгілердің физика-механикалық қасиеттерін анықтау үшін, қорғау функцияларына және кию тиімділігіне теріс әсерін болдырмау үшін зерттеулер жүргізілді. Зерттеу нәтижесінде композиция компоненттерінің барынша оңтайлы шоғырлануы анықталды: ПВС – 8 г/л, КИ – 50 мл/л, МК – 5 г/л.

Негізгі сөздер: композициялық құрамы, Премьер Standard 210 матасы, микробиологиялық сынаулар, микробқа қарсы қасиеттері, зең саңырауқұлақтары.

РАЗРАБОТКА ПОЛИМЕРНОЙ КОМПОЗИЦИИ ДЛЯ ЗАЩИТЫ ТЕКСТИЛЬНОГО МАТЕРИАЛА ОТ БИОПОВРЕЖДЕНИЙ

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В статье представлен способ повышения микробиологической стойкости текстильных материалов в условиях эксплуатации. Проведены исследования с использованием поливинилового спирта (ПВС), малеиновой кислоты (МК) и раствора ионов серебра (ИС). Данная ткань была обработана аппретом на основе выбранных реагентов для улучшения антимикробных свойств текстильного материала. Кроме того, проведены исследования для выявления физико-механических свойств образцов обработанных разными концентрациями аппрета, для предотвращения отрицательного влияния на функции защиты и практичности носки. В результате исследования выявлены наиболее оптимальные концентрации компонентов композиции: ПВС – 8 г/л, ИС – 50 мл/л, МК – 5 г/л.

Ключевые слова: композиционный состав, ткань Премьер Standard 210, микробиологические испытания, антимикробные свойства, грибы.

Introduction

Typical requirements for standard employee's work wear are usually reduced to ensuring its protective functions and practicality of wear. In recent years, the question has arisen of the need to create completely new materials necessary for special clothing. Certain substances and finishing methods are used to give certain properties.

Due to the huge material losses caused by the action of microorganisms, at the moment, more attention is paid to the biosecurity of various materials, including textiles, which are damaged during their production, storage and operation [1].

Materials and research methods

Laboratory studies were conducted using physical, mechanical, and microbiological testing methods.

The main objects of research in this work were:

- fabric Premier Standard 210 (article 81423);
- chemical compounds: polyvinyl alcohol, maleic acid, silver ion solution.

Results and their discussion

We have conducted research on the development of a composition for sizing mixed fabrics in order to improve the antimicrobial properties of textile materials under operating conditions. Maleic acid (MA), polyvinyl alcohol (PVA) and a solution of silver ions (SI) were taken in the composition of the sizing composition.

A fabric sample of 20 × 20 cm it was treated with an aqueous solution of polymer compositions of various concentrations [2]. Concentrations are shown in table 1.

Microbiological studies were performed on untreated and treated samples of mixed fabric [3]. *Aspergillus niger*, *Penicillium brevi* and *Trichoderma viride* fungi were used as test cultures to test for fungal resistance.

The tissue samples under study were infected with a fungi suspension and transferred to Petri dishes. Next, Petri dishes were placed in a desiccator with water. The desiccator with water was used to provide the necessary

humidity. Incubation was carried out for 28 days at a temperature of 30°C [4]

As a result, after 28 days, the growth of *Penicillium brevi* and *Trichoderma viride* fungi was detected on the untreated tissue sample. The intensity of fungal germination was 5 points (noticeably extensive tissue damage by fungi). The growth rate of the *Aspergillus niger* fungus in the control sample was estimated at 3 points

(noticeable growth, but not over the entire surface of infection).

The growth of *Penicillium brevi* and *Aspergillus niger* fungi was observed on the fabric samples treated with this composition, but the intensity of their germination was insignificant, and the growth of *Trichoderma viride* was suppressed (Fig.1).

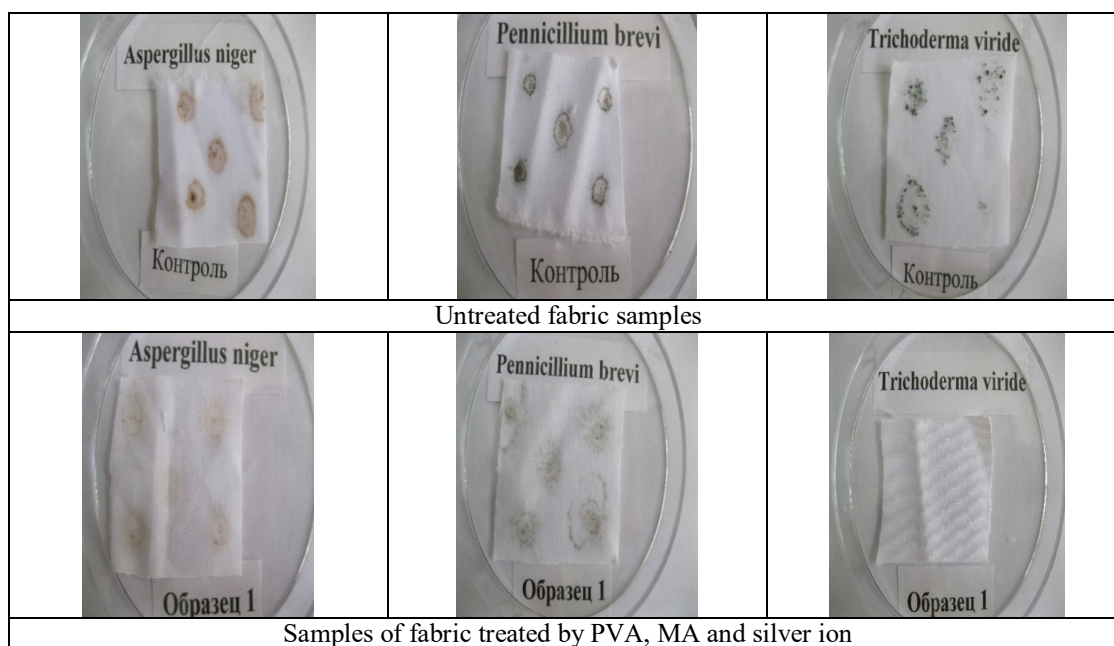


Figure 1 – Fabric samples exposed to fungi

The contamination of fabric samples was also investigated. For verification, swabs were taken from fabric samples. Swabs were taken using sterile moistened cotton swabs. Before seeding the washings, 5 ml of an isotonic sodium chloride solution was added to the swab. The tampon was washed thoroughly, after which 0.1 ml of flushing fluid was placed in a Petri dish with nutrient medium. The cups were placed in a thermostat at 30°C. A preliminary count of the

grown colonies was made after 48 hours, the final - after 72 hours [5].

As a result of research, it was found that the growth of bacteria in cups containing flushes from untreated tissue samples significantly increased. On the surface of untreated mixed fabric (25 cm²) contains about 200 cells. In the treated fabric samples, microbial growth was absent (Fig. 2).

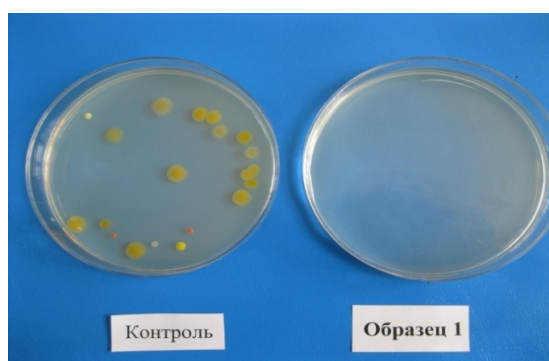


Figure 2 - Bacterial growth from flushing from untreated and treated mixed fabric samples

Quality assessment of finished fabrics was carried out on the physico-mechanical properties such as crease-resistance, tensile characteristics and abrasion resistance as well as organoleptically.

As a result of the assessment on organoleptic indicators, it was found that the fabric becomes smooth and easily slips off the hands.

Table 1 – Physic and mechanical properties of Premier Standard 210 fabric

№	Component concentration			Total angle of opening of folds, (°)	Breaking load (based on), N	Air permeability, dm ³ / m ² ×s
	PVA, g/l	SI, ml/l	MA, g/l			
1	8	100	5	160	372	35,5
2	4	100	5	165	377	33,6
3	8	50	1	178	394	34,3
4	4	50	5	168	405	33,5
5	8	100	1	158	390	35,4
6	4	100	1	159	421	35,1
7	8	50	5	171	499	35,8
8	4	50	1	180	367	35,9
Average index	-	-	-	167	403	34,8
The untreated fabric	-	-	-	114	330	33,5

Summary

The study revealed the most optimal concentrations of the composition components: PVA – 8 g/l, SI – 50 ml/l, MA – 5 g/l.

The results of the study revealed the acquired antimicrobial properties of tissue treated with an dressing composition based on polyvinyl alcohol, maleic acid and a solution of silver ions. The acquired properties have shown their resistance to the development of mold fungi on their surface, as well as to the resistance to harmful effects of microorganisms in operating conditions.

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