

The research of physical and mechanical properties of experimental samples of ceramic clinker tiles conducted at Obolsky Ceramic Plant showed the possibility of using of man-made products of power complex (sludge of chemical water treatment of combined heat and power plants) as an additive in the manufacture of ceramic building materials of general purpose. Addition of sludge of chemical water treatment allows to reduce the firing temperature of products, which is important in terms of energy saving.

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**ENZYME-CONTAINING SILICONE COMPOSITIONS
IN THE TECHNOLOGY OF SOFTENING
COTTON FABRICS**

**ФЕРМЕНТСОДЕРЖАЩИЕ СИЛИКОНОВЫЕ
КОМПОЗИЦИИ В ТЕХНОЛОГИИ УМЯГЧЕНИЯ
ХЛОПЧАТОБУМАЖНЫХ ТКАНЕЙ**

Lenko K. , Yasinskaya N., Skobova N., Lisovsky D.*

Vitebsk State Technological University, Belarus

*e-mail: kotya240497@mail.ru**

Ленько К.А. , Ясинская Н.Н., Скобова Н.В., Лисовский Д.Л.*

Витебский государственный технологический университет, Республика Беларусь

Keywords: silicone softener, biotechnology, drape, air permeability, hygroscopicity.

Ключевые слова: силиконовый мягчитель, биотехнология, драпируемость, воздухопроницаемость, гигроскопичность.

Abstract. The paper deals with softening researches of cotton bedding fabric with silicone Softsilicone softener and enzyme-containing silicone Softsilicone composition produced by Ferment LLC according to the periodic method in order to determine the effect of the enzyme use in the composition of this manufacturer on hygienic and physical-mechanical properties of the fabric during the final softening finish.

Аннотация. В работе проведены исследования по умягчению хлопчатобумажной ткани постельного назначения силиконовым аппретом-мягчителем «Софтсиликон» и ферментсодержащей силиконовой композицией «Софтсиликон+» фирмы ООО «Фермент» по периодическому способу с целью определения влияния использования ферментных препаратов в составе аппрета данного производителя на гигиенические и физико-механические свойства ткани в процессе заключительной умягчающей отделки.

At the stage of final finishing the textiles are given a beautiful appearance, fixed the width of the canvas, and smoothed. The solution to the issue of giving softness, bulk, silkiness to cotton fabrics and products is the technology of softening them in the process of final finishing.

The classic methods of softening fabrics provide an effect by applying various types of softening finishing agents. Their significant drawback is the short duration of the achieved result and its instability to household treatments [1].

Currently known methods of softening textile materials from cellulose fibers using enzyme preparations of cellulolytic and pectolytic action. Enzymatic modification of cellulose fibers is an innovative and environmentally friendly approach to solving the problem of softening terry fabrics and products.

Enzymes are natural biochemical catalysts of selective action – proteins with molecular weights from tens of thousands to a million or more, the macromolecules of which are built of amino acids linked into long chains by peptide bonds [2].

Earlier the authors conducted research on tissue bio-softening in a periodic way, where the operation of biological treatment with enzymes was preliminarily carried out, and the subsequent stage was processing in a silicone softener.

In Belarus, relatively recently, Ferment LLC entered the market of textile auxiliaries, offering a wide range of silicone softeners and enzyme preparations for processing textile materials.

In order to determine the effect of the enzyme use in the composition of this manufacturer on hygienic and physical-mechanical properties of the fabric in the laboratory of VSTU, studies were carried out to soften the cotton bedding fabric (surface density 120 g/m²) with the silicone Softsilicone softener (optimal conditions of action pH = 5, working t = 30–50 °C) and enzyme-containing silicone Softsilicone composition (optimal conditions of action pH = 5, working t = 30–50 °C) according to the periodic method.

The properties that affect the consumer characteristics of cotton bedding fabrics have been studied: drape coefficient (%), hygroscopicity (%) according to GOST 3816-81 "Methods for determining hygroscopic and water-repellent properties" and air

permeability ($\text{dm}^3/\text{cm}^2*\text{s}$) according to GOST 12088-77 "Interstate standard. Textile materials and articles thereof. Method for determining air permeability".

The drape coefficient was determined by 3D scanning using an ARTEC SPIDER portable 3D scanner. The scan results were saved in STL format and processed in the SolidWorks software package [3]. The assessment of the hygroscopicity and drape coefficient of the samples is shown in Figure 1. The assessment of the air permeability of the samples is shown in Figure 2. The control sample is taken as a bedding fabric without a final softening finish.

The hygroscopicity of the tissues treated with the test preparations is higher than that of the control sample. However, the presence of enzymes in the composition leads to a decrease in hygroscopicity.

When analyzing the coefficient of drape, one should take into account the following fact: the lower the value is, the softer the material will be. According to the histogram (Figure 1), there is a decline in this indicator after processing using two technologies. Moreover, the presence of enzymes in the composition also lowers the drape coefficient.

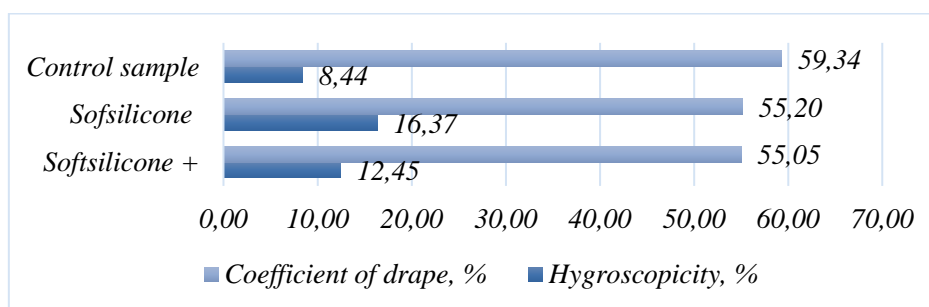


Figure 1 – Evaluation of hygroscopicity and drape coefficient of the test samples

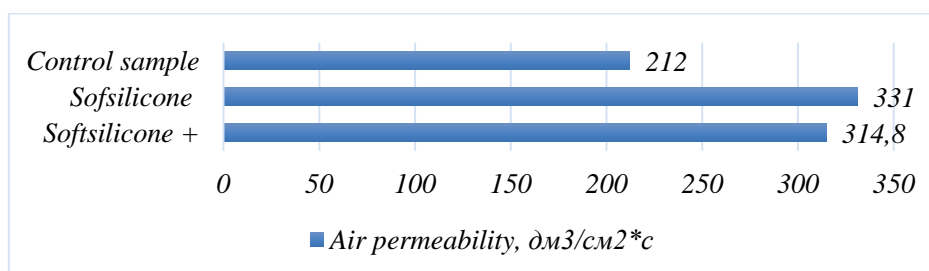


Figure 2 – Evaluation of air permeability of the test samples

The air permeability of the samples (Figure 2), which have undergone treatment with the investigated drugs, significantly increases compared to the control sample. This is probably due to the smoothing of the fibers with a silicone sizing, which creates an invisible film on the yarn, due to which the air spaces between the warp and weft threads increase in size. The numerical value of this indicator is within acceptable limits (more than $100 \text{ dm}^3/\text{cm}^2*\text{s}$).

Conclusion: The presence of an enzyme preparation in the composition leads to an increase in the softness and air permeability of cotton fabrics, but it results in a decrease in the hydrophilic properties of the textile material.

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INVESTIGATION OF THE DEPENDENCE OF THE QUALITY INDICES OF ROTOR SPUN YARN ON THE PROPORTION CONTENT OF REGENERATED FIBROUS WASTES IN THE MIXTURE

ИССЛЕДОВАНИЕ ЗАВИСИМОСТИ ПОКАЗАТЕЛЕЙ КАЧЕСТВА ПНЕВМОМЕХАНИЧЕСКОЙ ПРЯЖИ ОТ ДОЛЕВОГО СОДЕРЖАНИЯ РЕГЕНЕРИРОВАННЫХ ВОЛОКНИСТЫХ ОТХОДОВ В СМЕСКЕ

Makhkamova Sh. , Valieva Z., Temirov Sh.*

Tashkent Institute of Textile and Light Industry, Uzbekistan

*e-mail: shoirra-0218@mail.ru**

Махкамова Ш.Ф. , Валиева З.Ф., Темиров Ш.И.*

Ташкентский институт текстильной и легкой промышленности, Узбекистан

Keywords: rotor spinning machine, fibrous wastes, regenerated fiber, yarn, physical-and-mechanical properties.

Ключевые слова: пневмомеханическая прядильная машина, волокнистые отходы, регенерированные волокна, пряжа, физико-механические свойства.

Abstract. The article studies the influence of the proportion content of regenerated waste on the quality indicators of rotor spun yarn. Empirical formulas were compiled, allowing to predict the quality of yarn and breakage on spinning machines when changing the content of components.