

RESEARCH ON HYGIENIC PROPERTIES OF MATERIALS FOR UNDERWEAR

TKACHUK Oksana

Lutsk National Technical University, Lutsk, Ukraine

*Corresponding author: TKACHUK Oksana: e-mail tkachuk18oksana@gmail.com

Abstract: *Hygienic properties of materials for making underwear are important factors in ensuring human health, as they affect well-being and comfort. Creating the required microclimate of the undergarment layer is possible only using the textile materials with appropriate indicators of such properties as air permeability, hygroscopicity, and moisture conductivity. The purpose of paper is study of hygienic properties for different materials and identify the optimal composite with best level of comfort. To achieve a balanced combination of hygienic and operational properties of materials for bedding, it is recommended to use materials with a mixed fibrous composition or combine materials with different properties in the products.*

Key words: *hygienic properties, air permeability, hygroscopicity, and moisture conductivity.*

Undergarments should meet a complex of consumer requirements, including functional, social, operational, ergonomic, and aesthetic. Ergonomic requirements involve taking into account the features of the human body and combining anthropometric, hygienic, and other properties.

Hygienic properties of materials for making underwear are important factors in ensuring human health, as they affect well-being, comfort, and productivity. Underwear is worn under outer clothing and should therefore provide thermal comfort, including the transfer of moisture from clothing to the surrounding environment through absorption and evaporation, which is determined by the properties and thickness of textile materials. Creating the necessary microclimate of the undergarment layer is possible only through the use of textile materials with appropriate indicators of such properties as air permeability, hygroscopicity, and moisture conductivity.

The properties of textiles are influenced by the chemical and physical properties of the fibers from which they are composed [1], their content, the physical and mechanical characteristics of the yarns, as well as finishing processes. Since underwear is in direct contact with the skin, its hygiene properties are much more important than those of outerwear. Therefore, the purpose of this study is to evaluate the hygiene properties of materials used in the production of underwear in order to ensure comfort. The results of the study can be useful for manufacturers and consumers who can make an informed choice of materials and products based on their hygiene properties.

Hygiene properties of textile materials include indicators such as moisture absorbency, air permeability, static charge, and capillary properties.

Modern textile materials for lingerie and undergarments come in a wide variety of options that are constantly updated to follow fashion trends. Synthetic materials offer several advantages such as high mechanical strength, elasticity, resistance to wear, and protection against chemical and biological agents. However, their low

hygroscopicity and high electrification are some of their drawbacks.

Electrostatic properties of textile materials are evaluated by their specific surface electric resistance, which is measured in ohms. It is believed that the maximum allowable value for the specific surface electric resistance, when no negative effects occur during the use of the garment, is 10^{10} - 10^{12} ohms.

Research on the impact of textile materials on the hygienic properties of lingerie has been conducted on different types of woven and knitted fabrics with varying fiber composition and linear density, which are used in the production of JASMINE LINGERIE. The quality of the textile materials was evaluated based on the following parameters: hygroscopicity (%), specific surface electric resistance (ohms), capillarity (mm), and air permeability coefficient ($\text{dm}^3/\text{m}^2\text{s}$).

The research was conducted under standard climatic conditions ($\varphi=65\pm 2\%$, $t=20\pm 2^\circ\text{C}$). The specific surface electric resistance was measured using the IESTP-1 instrument. Hygroscopicity and capillarity were determined using a standard methodology [2], including hygroscopicity at $98\pm 1\%$ humidity for 4 hours, and capillarity measured using the PU-4 instrument.

Measurements of the hygiene properties of textile materials showed that the specific surface electric resistance of the investigated materials ranged from $2.0 \cdot 10^9$ to $1.4 \cdot 10^{12}$, which corresponds to permissible norms.

The hygroscopicity of textile materials containing synthetic fibers (elastane, polyamide, polyester) is 1.7-3.4%, while that of natural (cotton) fibers is 16.8%, and for mixtures of synthetic and natural fibers, it ranges from 11.7% to 15.6%. Thus, the hygroscopicity of textile materials with a mixture of fibers is somewhat lower compared to cotton fiber, but it exceeds the indicators of materials with synthetic fibers.

The capillarity of synthetic fiber materials is 11-17 mm, cotton fiber materials is 167 mm, and the mixture of synthetic and natural fibers is 135-160 mm. The air permeability of synthetic textile materials is 36.6 - $108.5 \text{ dm}^3/\text{m}^2\text{s}$, cotton fiber materials is $450 \text{ dm}^3/\text{m}^2\text{s}$, and the mixture of fibers is 55 - $105 \text{ dm}^3/\text{m}^2\text{s}$. Thus, air permeability depends not only on the fibrous composition but also on the structure of the textile material.

Therefore, the research on the indicators that characterize the hygienic properties of materials for underwear us to conclude that materials made of natural fibers have the best capillary and hygroscopic properties, air permeability, and the lowest specific surface electrical resistance. However, textile materials that contain synthetic fibers are characterized by better elasticity, strength, and resilience. Therefore, to achieve a balanced combination of hygienic and operational properties of materials for bedding, it is recommended to use materials with a mixed fibrous composition or combine materials with different properties in the products.

References

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