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**DESIGNING OF MEN'S JACKET CONSTRUCTION MADE OF
LUXURY SUIT MATERIALS TAKING IN TO ACCOUNT
PROPERTIES OF STUDIED MATERIALS**

Purpose. Evaluation of structural characteristics and water-repellent properties of luxury pure wool fabrics for suit to consider them when designing men's jacket.

Methodology. Experimental research methods on the basis of standardized methodology and the author's methodology and device for estimation the properties of suit fabrics were used. Graphical images of the results of experiments were performed using MS Excel software.

Results. The structural characteristics, indexes of water repellency and breathability, and pressing-in ability of luxury suit fabrics of «Scabal» company were defined.

Scientific novelty. It was found, that waterproof indexes of «Scabal» suit fabrics are equal to raincoat materials with a film coating; breathability indexes of these fabrics are very low or equal to zero; pressing-in ability of studied materials is worse in comparison with classical suit materials due to significant density of warp and weft and yarn fineness.

Practical value. Men's jacket design was developed considering properties of luxury suit materials.

Keywords: pure wool and woolen suit fabrics, breathability, water repellency, pressing-in coefficient, luxury goods.

Introduction. In the manufacture of sewing item the right choice of materials largely determines its quality, appearance, form stability and durability. Garment requirements are set through requirements for design and construction processes, processing technology and quality of materials and their properties. Microclimate under clothing, well-being and human performance depend on materials and their properties. Materials determine the functionality of clothing, when creating clothing, they are selected according to the appearance and age of the consumer and fashion trends [1]. With the development of science and technology, new types of fabrics and materials appear, they have new properties that need to be studied and explored in order to take into account in the processes of design and manufacturing. Therefore, scientifically justified choice of materials for sewing product is of great importance.

Objectives. The company «Scabal» with more than 75 years of experience, is one of the world's leading manufacturers of luxury suit fabrics for men. Manufacturers use only high-quality kinds of natural wool, silk, cashmere, mohair, with the addition of rare fibers. The company has an advanced approach to the development of luxury fabrics. The latest collections present special novelties: suit fabrics with platinum and golden thread, sapphire coating, lazurite, materials with fragments of diamonds which are woven directly into the structure of the woolen yarn, pure silk suit fabrics for men [2].

As it is stated by the manufacturer, pure wool fabrics of «Scabal» company have superior quality because of high quality raw materials for the manufacture of woolen yarn. «Scabal» was the first who developed fabrics of Super 120 and Super 150 standard, which are characterized by very thin and long fibers of the highest quality wool. In addition, these materials due to the considerable length of the fibers for yarn and their high degree of twist are highly crease-resistant, have the ability to restore the shape without pressing, they do not peeling and are waterproof [2]. «Scabal»

fabrics are extremely light, have large density of yarns, good heat retention and water repellent properties. All these typical properties of suit materials and also new ones require additional studies to determine their numerical indexes, compare with the requirements of standards and taking into account during the product designing.

The subject of the study – suit fabrics of «Scabal» company. The object of the study – the evaluation process of the structural characteristics and properties of suit fabrics for the manufacture of men's luxury suits. The existing standards of pure wool and woolen suit materials and their compliance with modern materials are also of great interest.

Research results. Evaluation of structural characteristics of «Scabal» suit materials and classic suit fabrics is made according to [3, 4]. The characteristics of investigated fabrics are presented in Table 1 and Table 2, respectively.

Table 1

Characteristic of pure wool and woolen suit fabrics of «Scabal» company

Conventional sign of fabric	Surface density, g/m ²	Raw material composition, %	The number of threads in 10 cm		Linear density, tex		Thickness, mm	Weave
			warp	weft	warp	weft		
K1	183	Wool – 95; silk – 5	380	400	26,6	19,2	0,39	Plain
K2	181	Wool – 90; silk – 10	440	400	21,4	20,8	0,40	Finely-patterned
K3	190	Wool – 100	360	320	33,4	22,8	0,40	Finely-patterned
K4	171	Wool – 100	440	400	20,8	20,8	0,42	Finely-patterned
K5	170	Wool – 100	400	330	27,6	18,8	0,40	Finely-patterned
K6	219	Wool – 90; silk – 10	270	280	37,6	41,0	0,37	Finely-patterned
K7	165	Wool – 100	340	320	23,0	24,0	0,39	Finely-patterned

The research found that the selected «Scabal» suit fabric for making men's suits is characterized by surface density from 165 to 219 g/m². According to the standard [5], most of them within the group of worsted fabrics for dresses but not suits, with a surface density of 190g/m², so materials have more lightweight surface density compared to standard requirements. The thickness of the fabric is from 0,37 to 0,42 mm that is less than the thickness of the classic costume materials (from 0,40 to 0,57 mm). Investigated fabrics of «Scabal» company have a density of 270 to 440 threads per 10 cm in warp and from 280 to 400 threads per 10 cm in weft, this indicates a higher density of warp and weft in comparison with classical suit materials (from 160 to 290 in warp and from 160 to 320 in weft). The linear density of the studied types of fabrics ranging from 20,8 to 37,6 tex in warp and from 18,8 to 41,0 tex in weft that is lower than the normative values according to [5] (40 tex). Thus, «Scabal» materials are more lightweight by surface density, more dense by the number of threads per 10 cm in warp and weft, less thick compared to the classic suit fabric.

Table 2

Characteristic of classic pure wool and woolen suit fabrics

Type of material, conventional sign	Surface density, g/m ²	Raw material composition, %	The number of threads in 10 cm		Linear density, tex		Thickness, mm	Weave
			warp	weft	warp	weft		
Worsted and woolen Kl 1	234	Wool – 80; PAN– 20	160	160	14,2	15,6	0,57	Plain
Worsted Kl 2	186	Wool – 100	290	250	14,0	17,8	0,44	Plain
Worsted and woolen Kl 3	215	Wool – 100	210	320	40,4	40,6	0,40	Twill
Worsted and woolen Kl 4	224	Wool – 100	240	250	49,2	42,4	0,49	Plain
Worsted and woolen Kl 5	235	Wool – 95; PAN – 5	180	155	38,0	45,0	0,48	Plain

As it is stated by manufacturers, «Scabal» materials are characterized by high water repellent properties, which is not typical for classical suit materials [1]. The ability to repel moisture is given to luxury materials to ensure a high level of consumers’ comfort as it is enough to shake spilled liquid off the surface of a suit. To assess water repellent properties of «Scabal» suit fabrics experimental research was carried out with help of special device for determination of resistance to moisture (spray test) by the method according to ISO 4920:2005 [6]. Four types of «Scabal» luxury costume materials were selected as the object of study. The experimental results are presented in Fig. 1-2 and in Table 3.

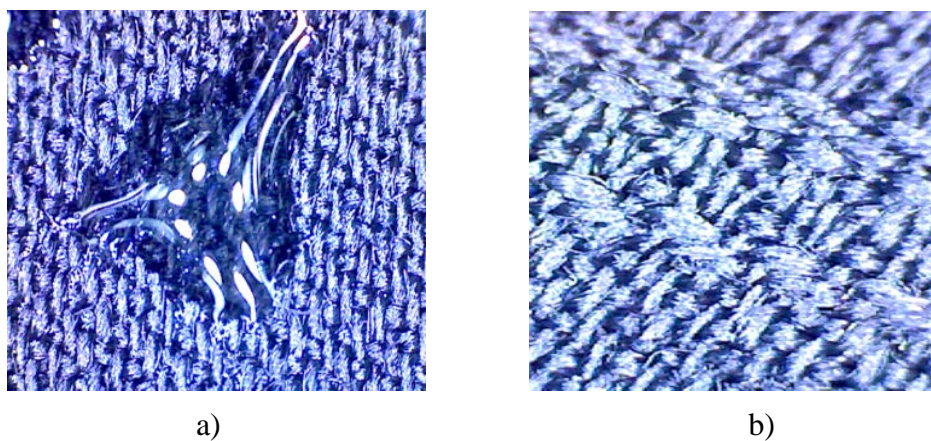


Fig. 1. Pictures of fabric samples K1 after wetting under a microscope at 20 times increase: a) a front side; b) a back side

Water-repelling properties are provided, among others, by weave density with a very small diameter of yarn, as the materials are not additionally saturated. The national standard for woolen suit fabrics has no quality indexes to characterize their resistance to moisture. That is why for the comparison of the experimental values of water repellency we use corresponding standard for raincoat material (Table 3) [7]. According to the results of the experiment, suit fabrics by company

«Scabal» correspond by their values of water repellency to raincoat materials with film coating and water-repellent finish, i.e. don't let water in.

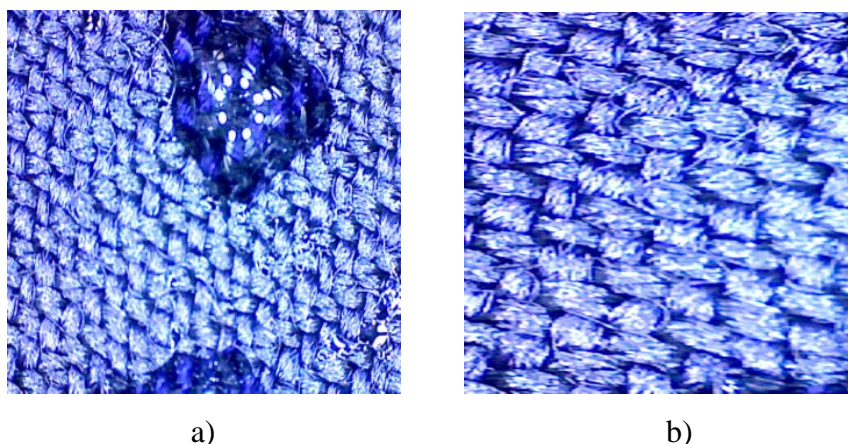


Fig. 2. Pictures of fabric samples K3 after wetting under a microscope at 20 times increase: a) a front side; b) a back side

Table 3

The results of determining resistance to the wetting of «Scabal» costume fabrics

Type of material, conventional sign, manufacturer	The results by the the photographic scale AATCC	The normative value of water repellency for raincoat fabrics in accordance with ISO 28486-90
Suit K1 «Scabal»	ISO3 = AATCC 80	Not less than 80 nominal units – for fabrics with film coating in 3 layers; not less than 70 nominal units – for raincoats with a film coating in 1 layer; not less than 50 nominal units – for raincoat fabrics with water repellent treatment
Suit K2 «Scabal»	ISO1 = AATCC 50	
Suit K3 «Scabal»	ISO2 = AATCC 70	
Suit K4 «Scabal»	ISO3 = AATCC 80	

High breathability is one of the fundamental properties of the material, which provides comfort of the person during the product's use. According to the standard [8] for coat and suit range products the value of breathability should be at $60 \text{ dm}^3/(\text{m}^2 \cdot \text{s})$. If the breathability of the package is less than 10, then it is necessary to provide the product with additional structural elements or technological methods for the comfort of a person and this can affect the appearance and design of the product. Experimental study for breathability determination was carried out by standardized methods in accordance with ISO 12088-77 on the basis of model FF-12/A [8]. Sets of materials were picked up for experimental study, they contained variants of suit fabrics, interlining and lining materials. Experimental results for breathability are presented in the Table 4.

It was found that suit fabrics K1 and K6 are similar in breathability performance, fabrics K7 and K4 do not let air in, so they were excluded from further research. Selected types of fabrics were included into sets for future research and choosing the best option for making men's jacket. According to research optimal set of materials K1+D1+P1 was selected, which has a maximum breathability value ($11,0 \text{ dm}^3/(\text{m}^2 \cdot \text{s})$). Comparison of the obtained values with standards

according to [9] indicates low breathability value for luxury suit fabrics and accordingly their sets, that should be taken into account when designing a product using the constructional and technological methods.

Table 4

Breathability value of «Scabal» suit fabrics and sets based on them

Conventional sign of material	The actual value of breathability $\text{dm}^3/(\text{m}^2 \cdot \text{s})$										Normative values of breathability in accordance with ISO 25295:2005, $\text{dm}^3/(\text{m}^2 \cdot \text{s})$		
	For top	For lining				For the set: suit fabric + woven interfacing		For the set: suit fabric + woven interfacing + lining					
		P1	P2	P3	P4	D1	D2	P1	P2	P3		P4	
K1	30,6	64,8	31,5	12,4	30,8	20,8	11,9	11,0	4,2	1,5	4,4	Not less than 60	
K6	30,8					20,0	10,9	8,8	2,5	0	3,9		
K7	0					-	-	-	-	-	-		-
K4	0					-	-	-	-	-	-		-

While manufacturing products of pure wool and woolen materials such technological methods as pressing-in and wet-heat stretching are often used to provide three-dimensional shape of clothing details.

When making men’s jacket, pressing-in is used for a sleeve cap, an armhole, a shoulder cut of the back, a neckline, elbow sections, the leading edge. To assess the ability of suit fabrics to be pressed-in the experimental research was carried out using the experimental device developed at the Department of technologies and designing of sewing products for studying the pressing-in process [10]. Fig. 3-5 show the results of the values of the critical coefficient for the pressing-in of «Scabal» suit fabrics and classic fabrics while being pressed-in on warp and weft at 45° to the warp.

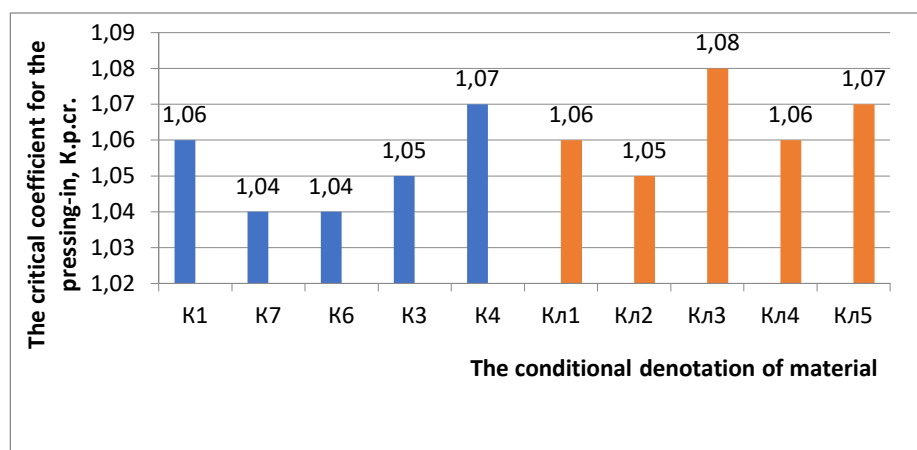


Fig. 3. Diagrams of the critical coefficient values of pressing-in for «Scabal» suit fabrics and classic ones at pressing-in by warp

The experimental results give reason to conclude that «Scabal» suit fabrics are pressed-in almost equally towards the warp in comparison with classical suit materials. Degree of pressing-in on weft in «Scabal» suit fabrics gets worse compared to classic materials (3 % average). Results of materials pressing-in under 45° are: classic materials are pressed-in better compared with «Scabal» fabrics (6 %).

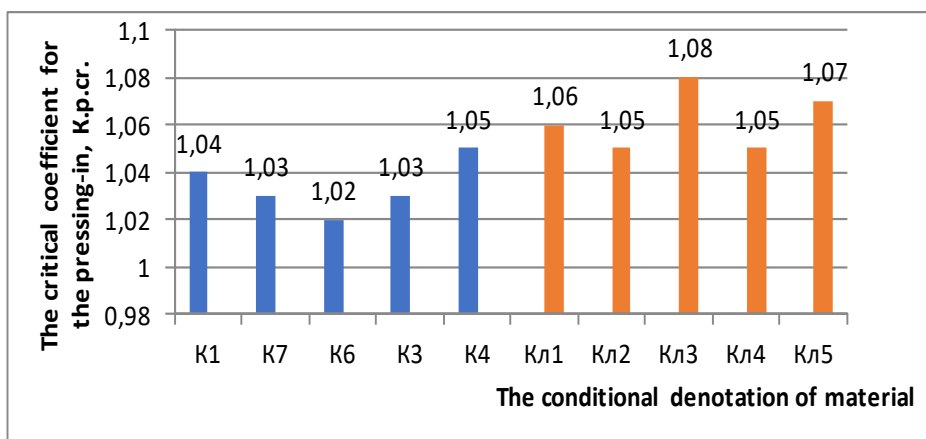


Fig. 4. Diagrams of the critical coefficient values of pressing-in for «Scabal» suit fabrics and classic ones at pressing-in by weft

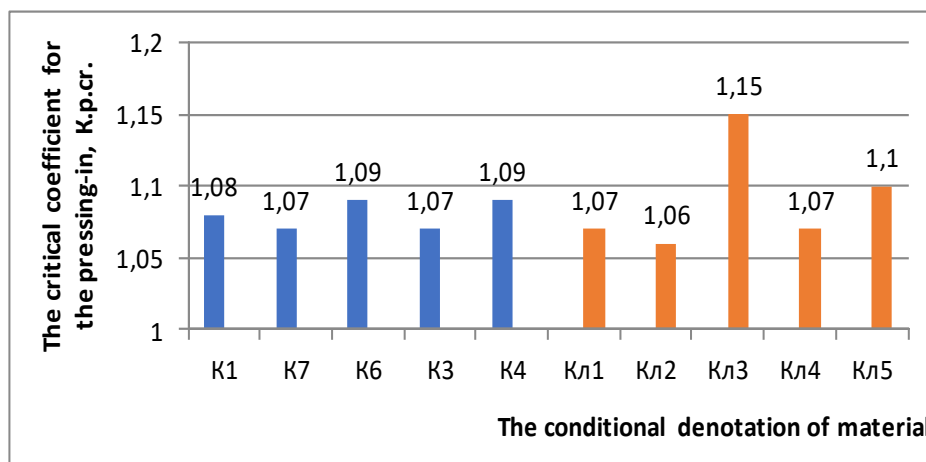


Fig. 5. Diagrams of critical coefficient values for pressing-in for «Scabal» suit fabrics and classic fabrics pressing-in at 45° to the warp



Fig.6. Design of men's jacket, developed taking into consideration properties of materials

Design features of men's jackets are:

- an increase in allowances at the chest line to 9 cm and hip line to 5 cm for loose fit, shoulder cut length increase to 1 cm to provide breathability of construction;
- designing of a single-breasted open fastener on two buttonholes and two buttons (location of the first buttonhole is 1,5 cm above the waist) to increase breathability;
- designing of relief seams on the back and vents to ensure free movement and air circulation of the product;
- designing of open vents at elbow seams of sleeves;
- decrease in fit value for sleeve cap to 2 cm by transferring 2 cm of cap fit to dart at elbow seam of a sleeve;
- decrease of a fit by shoulder cut length to 0,5 cm.

Studies have shown that the existing standards for pure wool and woolen suit materials need some supplements about new materials and their properties.

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ПРОЕКТУВАННЯ КОНСТРУКЦІЇ ПІДЖАКА ЧОЛОВІЧОГО З КОСТЮМНИХ ТКАНИН КЛАСУ ЛЮКС З УРАХУВАННЯМ ВЛАСТИВОСТЕЙ ДОСЛІДЖУВАНИХ МАТЕРІАЛІВ

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Мета. Оцінка структурних характеристик та водовідштовхувальних властивостей чистововняних костюмних тканин класу люкс для їх врахування при проектуванні конструкції піджака чоловічого.

Методика. Використано методи експериментального дослідження за стандартизованими методиками та авторську методику та пристрій для оцінки властивостей костюмних тканин. Побудову графічних зображень результатів експериментів виконано з використанням програмного забезпечення MS Excel.

Результати. Визначено структурні характеристики, показники водовідштовхування, повітропроникності та здатності до спрасування костюмних тканин класу люкс «Scabal».

Наукова новизна. Встановлено, що за показниками водовідштовхування костюмні тканини «Scabal» прирівнюються до плащових матеріалів з плівковим покриттям; показники повітропроникності цих тканин дуже низькі або рівні нулю; здатність до спрасування досліджуваних матеріалів гірша у порівнянні з класичними костюмними

матеріалами за рахунок значної щільності систем ниток основи та утку, а також тонини ниток.

Практична значимість. Побудовано конструкцію чоловічого піджака з врахуванням властивостей костюмних матеріалів класу люкс.

Ключові слова: чистововняні та вовняні костюмні матеріали, повітропроникність, водовідштовхування, коефіцієнт спрасування, вироби класу люкс.

ПРОЕКТИРОВАНИЕ КОНСТРУКЦИИ МУЖСКОГО ПИДЖАКА ИЗ КОСТЮМНЫХ ТКАНЕЙ КЛАССА ЛЮКС С УЧЕТОМ СВОЙСТВ ИССЛЕДУЕМЫХ МАТЕРИАЛОВ ВОДЗИНСКАЯ О. И., ТКАЛЕНКО А. Н.

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Цель. Оценка структурных характеристик и водоотталкивающих свойств чистошерстяных костюмных тканей класса люкс для учета их при проектировании конструкции мужского пиджака.

Методика. Использованы методы экспериментального исследования по стандартизированным методикам, а также авторская методика и прибор для оценки свойств костюмных тканей. Построение графических изображений результатов экспериментов выполнено с использованием программного обеспечения MS Excel.

Результаты. Определены структурные характеристики, показатели водоотталкивания, воздухопроницаемости и способности к сутюживанию костюмных тканей класса люкс «Scabal».

Научная новизна. Установлено, что по показателям водоотталкивания костюмные ткани «Scabal» приравниваются к плащевым материалам с пленочным покрытием; показатели воздухопроницаемости этих тканей очень низкие или равны нулю; способность к сутюживанию исследуемых материалов ниже по сравнению с классическими костюмными материалами за счет значительной плотности систем нитей основы и утка, а также тонины нитей.

Практическая значимость. Выполнено построение конструкции мужского пиджака с учетом свойств костюмных материалов класса люкс.

Ключевые слова: чистошерстяные и шерстяные костюмные ткани, воздухопроницаемость, водоотталкивание, коэффициент сутюживания, изделия класса люкс.