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THE BEHAVIOUR OF FABRICS USED FOR *ANTIMIS* PRODUCTION TO PILLING

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Abstract: *The present study about the behaviour of plain textiles used for the production of antimis (Christian-orthodox liturgical item used in the liturgy) to pilling explores the functional classification of different types of antimis as a textile product made out the following different types of fabrics: natural silk, flax, viscose, polyamide 6.6.*
Pilling is a phenomenon which consists of the formation of small balls made out of fibre congeries on the textile's surface due to attrition and fatigue.
For textiles used as liturgical items, the process of pilling formation includes the following stages: the emergence of the pilling surfaces (the formation of fuzzy), fibre tangle (appearance of small balls), and the detachment of small balls from the fabric's surface.
The analysis method of pilling for liturgical items made out the four types of fabrics mentioned above consists of stereoscopic microscopy techniques and electronic microscopy methods (SEM). The images of textiles samples (yarns and fabrics) will be captured using a video microscope. Quantitative tests have been done to determine the metric number and the tex title of the above-mentioned fabrics.
The increased resistance of silk to pilling compared to nylon, flax, and viscose can be attributed to the chemical properties of fibres and structural characteristics of silk fabric. The structural compactness of the same fiber mixture of natural silk fabric with bonded fabric will have a higher resistance coefficient to pilling compared to the other mentioned fabrics. Through this, the value of use and durability of the antimis will increase.

Key words: *liturgical item, pilling, textile surface, structure characteristics, fastness*

1. INTRODUCTION

The present study about the behaviour of plain textiles used for the production of antimis (Christian-orthodox liturgical item used in the liturgy) to pilling explores the functional classification of antimis as a textile product made out the following different types of fabrics: natural silk, flax, viscose, polyamide 6.6.

Pilling is a phenomenon which consists of the formation of small balls made out of fibre congeries on the textile's surface due to attrition and fatigue.The phenomenon of pilling appears both in the case of chemical fibres and natural fibres.

As in the study of engineering textile surfaces have a leading role both macro and microtextiles units (microfibers, yarns, fibers, fibrils), in the present work will analyze the behavior of each part of textile fabric in relation to the phenomenon of pilling.

2. GENERAL INFORMATION

For textiles used as liturgical items, the process of pilling formation includes the following stages: the emergence of the pilling surfaces (the formation of fuzzy), fibre tangle (appearance of small balls), and the detachment of small balls from the fabric's surface.

Observations made by L. Szego [1], P. Braun, W. Albrecht [3] concerning the cause of formation of small balls show that the ends of the fibers, which are fixed in the product in a superficially way, formed first on the surface of plain textiles a loop, which is exacerbating the friction by surface rubbing, favoring the agglomeration of yarns.

In practice, high adhesion to fiber slows the migration of fibres from the inside. A similar effect is obtained in the case of a high bending stiffness. Fiber tenacity determines the length and density of the pilling layer; if fiber breaks easily, it forms a dense and shorter coat. Therefore, we first modify the design of macro-molecular textile surface appearance fluffy layer (fuzzy). It finds changing the layout macro-molecular textile surface appearance fluffy layer (fuzzy). As an intermediate stage for quality depreciation of plain textiles, it could be reported the occurrence of pilling small balls, which feature the ravel the fibers stemming from the yarns of weft or warp of fabric. A final stage of pilling formation is the detachment of small balls from the fabric's surface.

The basis of the occurrence of pilling is the formation of loops that start immediately after the piling layer has reached a specific density and length (length criticism). [4]

The phenomenon is more pronounced in articles of man-made fibres or mixtures of synthetic and natural fibres, textile structures open and flexible being altered after the fibres emergence and by the persistence of built-up areas which is generated. Occurrence of pilling is determined by the mechanical properties of the fibres components through the tensile strength, rigidity to inflection, through repeated bending, by the geometrical features of fibers, by the yarn structure (the degree of twisting, the original hairiness), by the structure of the textile fabric.

A key feature of the aspect is the ability of the pilling formation, which is in close connection with the uniformity of the surface (flatness, color), degree of gloss (glossy, matte, semi matte), crease resistance. [5]

The tendency of pilling – the resistance to pilling assessment of subjective evaluation methods and measuring objective, involving: initiation of the test-pieces, using standardized test machines, methods of evaluation and relevant indices of expression; modeling phenomena with detailing each phase of generation and its use in optimization of textile structure.

After several experiments, on specific test s pilling imulators, emerges a predominant idea experimentally confirmed, influencing the pilling, namely, structural compactness. [6]

Therefore, the pilling it is a typical emergence of flat textiles, which consists in shaping of agglomerated areas of fibres, being adherent, as a result of the action of the forces of friction which are affecting their appearance.

Because the effect of pilling affects the quality of look and functionality of the textile products referred to above, namely, of *antimis*, its quantification by simulating operating conditions, is mandatory, and it standardizes. [7]

Therefore, for the higher coefficient of torsion and for the minimum length of push-ups, the resistance to pilling, for the yarns from the fabric structure, has maximum values for the fibrous materials with the same composition. [8]

2. EXPERIMENTATIONS

3.1.Presentation of antimis

It is a liturgical use textile object, present at the Holy altar, placed on the Holy table, under the Gospel. Antimis' dimensions are: length = 60 cm, width = 45-50 cm; the shape is generally rectangular or square. It has function, which must withstand more bending and compression, during his use , whereas every time, it's unfolded and folded during divine service, and on the stretched surface bread crumbs with a sponge and are also placed the holy gifts (disc and chalice) [9]. It is necessary that the crumbs to not slip during mass, does not pass through the fabric.

On the self, the antimis sits folded on the Holy Table, forming the 9 borders which correspond to 3 layers overlapping (sheaths). Here, we encounter the permanent bending of the folds (streaks) that constitute the nine frames.

***Fig. 1**: Antimis printed on woven natural silk, private collection, 1848*

Repeated bending, flexing, and above all, generates fatigue, faster than repeated laying, because it determines the reduction of the reduction of the connections between the fibers. This may explain why synthetic fiber products presents a high resistance to repeated requests of traction, but significantly less from repeated bending requests. [10]

To individualize the reaction of a certain type of fiber and a particular type of fabric from which different, apply the methods of testing standard for yarn samples (wires) or pieces from fabrics.

Test methods with one-way stretch-looping - Schieffer, leads to the following observations: molecular structure of fibers and fiber surface condition influence the friction between fibres and thus resistance to repeated past participles during evaluation of textile products.

Test method with two-way stretch and looping-Schopper [11], is used to characterize the wires (samples) and fabric strips for standardized dimensions.

The return of the antimis from the folding reaction analysis leads to the reaction to request alternative bending of antimis. The entire set of fibre (yarn, fabric), during the request for alternate bending-permanent, structural factors are involved for further disruption as frictional forces between yarn and fibers.

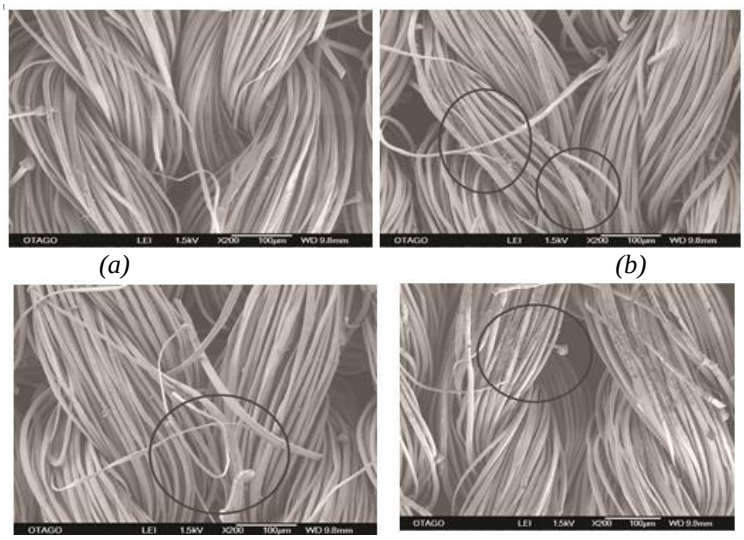
3.2. Textile raw material of antimis

According to liturgal writers, as well as major Nicholas Cabasilas and Symeon of Thessaloniki, Theodor Studite, Nicephorus the confessor [12], which have become normative for Church decoration rules and functions in the cultic act, the antimis must be matter of provenance protein (silk) or belong to the plant kingdom (flax, cotton, sisal, bamboo, stinging nettle). This

tradition with respect to the raw materials from which is made the antimis is quite old, starting with III-IV centuries a.Hr. until nowadays.

3.3. Methods

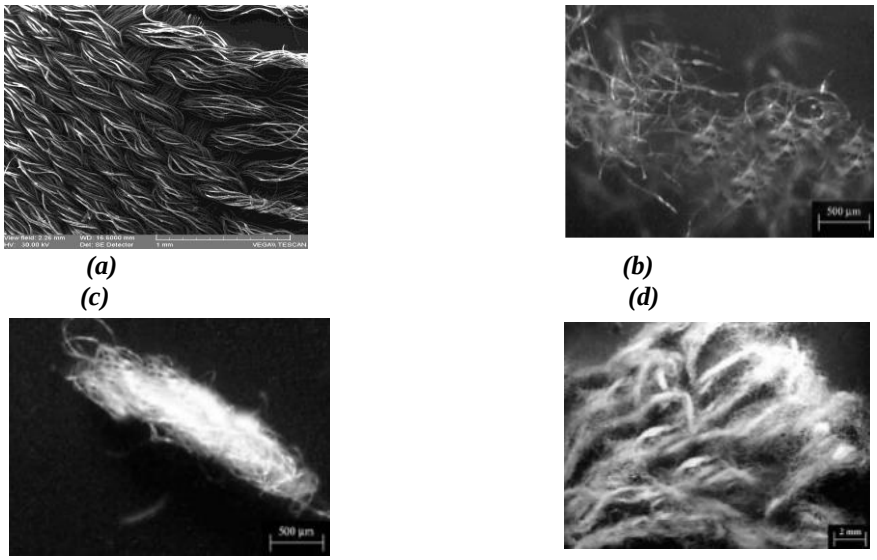
Methods of analysis of the pilling phenomenon for: silk fabrics, nylon 6.6 fabrics (polyamide 100%), natural flax fabrics, viscose fabrics - optical microscopy techniques of reflection and electron microscopy methods-methods of scanning electron microscopy (SEM). It has sought to highlight some tranforation or damage generated by processes of use or as a result of wear or mechanical stresses (abrasion caused by rubbing the sponge of textile surface). Standard samples shall be taken from the raw materials intended for confecion of antimis.



(a) *(b)*

(c) *(d)*

***Fig. 2**: Bundles of yarns present in natural silk fabric (catch SEM 200 X). (a) prior to the formation of pillingului; (b) formation of downy-layer fuzzy; (c) tangle of fibres (appearance of small balls); (d) the occurrence of small balls and separation.*



(a) ***(b)***

(c) ***(d)***

***Fig. 4**: Fragment of woven nylon 6 (polyamide)-SEM video capture: (a) prior to the formation of pillingului (100 X); (b) formation of downy-layer fuzzy (1000 X);(c). pill ball (1000 X); (d) the occurrence of small balls and separation.*

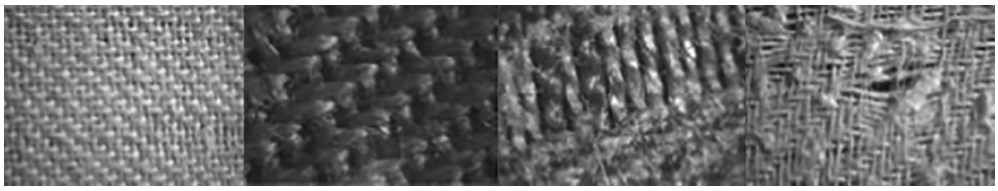


Fig. 3*: Fragments of woven flax - capture video microscope (electron steroscopic microscopy).(a) prior to the formation of pillingului; (b) formation of downy-layer fuzzy; (c) tangle of fibres (appearance of small balls); (d) the occurrence of small balls and separation.*

It have been highlighted some deterioration stemming from attrition on the textile surface of antimis due to the mechanical stresses and abrasion leading to the formation of pilling.

3.4. Cantitative experiments for determining the metric number and title of tex metric of fabrics of which were made from four different types of antimis textile raw material.

Have got ten pieces from bits of yarn with length = 10 cm from natural silk type, flax, polyester and polyamide. We mention that the fabric is simple-type bond cloth, with an average rate of compactness and both wires from the warp and the weft are of the same size.Were weighed on an electronic balance Partner Was 220/C/2 laboratory TPMI Iași and found the following average value:

Table 1: *Metric number*

Pieces of yarns	Natural silk	Flax	Polyamide	Viscoze
dimension	10 cm	10 cm	10 cm	10 cm
Mass	2,4 mg	3,4 mg	2,8 mg	2 mg
Nm (m/g)	41	29	35	50

Table 2. Thinness index number

Index	Natural silk	Flax	Polyamide	Viscoze
Ttex	24, 39	34,48	28,57	20

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No	Type of yarn	The value of the coefficient A
1	Natural silk yarn	0.0410
2	Flax yarn	0.0350
3	Polyamide yarn	0.0474
4	Viscoze yarn	0.0340

Knowledge of the degree of thinness yarns (including yarn diameter) and number of wires from weft and warp lead us to appreciation of the quality of the fabric that can cover the value of utilizing of antimis. During the evaluation, the antimis, from rest position (folded), is unfolded and subjected to tensile force and tension.

4. CONCLUSIONS

Personal contribution within original research lies in reevaluating natural silk fabrics for the production of antimis conforms to the XVII, XVIII, XIX centuries.

Structural compactness of the natural silk fabrics, generated by the type of connection, will have a higher resistance to pilling in relation to woven fabrics of viscose, woven fabrics of nylon polyamide 6.6 (100%), 100% woven fabrics of flax and thus will increase the amount of use and durability of the textile product.

The occurrence of pilling in the case of antimis, unlike clothing products, which can still be functional in its early phase, makes the value of utilizing it to be compromised.

When are gathered on the surface of antimis, the crumbs from wheat (Holy Flesh) and poured into the chalice, where its are mixed with matter of wine (Holy Blood) the priest and the faithful shares, these pilling small balls swallow with Holy Communion.

The presence of pilling involves another shortcoming of the symbolic meanings of textile surface printed illustration of antimis, couldn't understanding clearly religious scenes or characters' faces displayed in the illustration of antimis. Pilling influence the sensory comfort of touch. Pilling, as a determining factor in reaction to wear during use, amplifies or lowers the life of textile product.

Testing of textiles behaviour from repeated mechanical stresses (fatigue) is one of the most appropriate methods for the assessment of the durability of the textile products. Fatigue of the raw materials (fabrics of antimis production) quantify through objective and indices are evaluated subjectively by visual analysis and sensory perception. [13] Thus, standard mechanical properties indices are welking until reaching destruction. The phenomena is installed in dynamic and alternative request. Can be seen from simple requests (compression, tensile, bending, friction) or complex (dissolution, erasing contour drawing).

Analyzing the four types of antimis made of natural silk fabrics, of polyamide, of flax, and of viscoze, it could be noted, according to the index table and quality *Engineer Handbook Plumber* [14], that behaves best at destroying phenomenon the antimis of silk products. Even to the antimis kept in privat colections or in museums, restored after the use, the silk is presented in the best possible conditions.

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