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PHYSICAL AND MECHANICAL PROPERTIES OF NONWOVEN MATERIALS BASED ON NATURAL SILK

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Annotation. *The article discusses the use of non-recyclable fibrous waste of natural silk in consumer textile products, in particular, in the production of non-woven materials, with the subsequent production of consumer goods. Primary and secondary silk fibers are combined with other chemical fibers to produce products. The thermopress process was used to create the nonwoven material. High physical and mechanical qualities of materials produced from primary and secondary fibers were revealed by analysis of experimental data.*

Key words: *Natural silk, textile products, waste from the textile industry, waste from silk production, waste processing, breaking stress, elongation, strength.*

In developed countries, recycled materials are used, while waste is a valuable raw material. To expand resources and protect the environment, the most important thing is the rational use of waste polymer materials. Recycling of chemical and synthetic fiber materials has increased in the textile industry in recent years. At the same time, new devices were developed for processing waste from textile production. The latest technologies and methods for extruding polyolefin materials directly at textile plants allow the use of more different types of textile raw materials. These include yarn, waste staple fibers, man-made filaments, nonwovens, various laminates, rigid fabric scraps, knitwear and knitwear, and waste from extrusion plants [1].

Research has shown that fibrous waste, after special preparation, can be used to create polymer composite materials. The resulting materials have fairly high antifriction and electrical insulating properties, as well as increased bending and impact strength. Natural silk, the production of which is growing every year, is another valuable wealth of the Republic of Uzbekistan, along with cotton. Since cocoons cost 30% of the cost of raw silk, their judicious use is of great importance.

When it comes to wisely spending valuable raw materials, there are many different variables. For every kilogram of raw silk, more than one kilogram of various wastes are produced (fibrous waste from cocoon winding and undamaged cocoon unwinding) due to deficiencies in the silkworm rearing process and irregularities in the primary processing and winding of cocoons in the coconut and silver production [2].

A mixture of polyamide fiber with natural silk, containing at least 30% silk, has extremely high thermal insulation properties. After impregnation with thermosetting resins and curing, canvases are made from these mixtures. They proposed using stitched knitwear on a non-woven basis to cover thermal insulation structures made from silk production waste [3-5].

This study examines methods for processing natural silk waste into nonwoven materials, as well as the physical and mechanical properties of materials obtained from them. To make the materials more environmentally friendly and reduce production costs, fibrous waste from silk production is added to the mixture. In the production of nonwoven materials, the use of recycled silk fibers will reduce the cost of cheese. When creating nonwoven materials, pieces of wool fly, lavsan (linear density 0.17 tex, average length 35 mm) and viscose (linear density 0.31 tex, average length 38 mm) fibers with a thickness of 25-35 mm are used. When working with mixtures, first waste natural silk with lavsan fibers or viscose are thoroughly mixed in the required ratio.

To ensure the necessary physical and mechanical properties of the resulting nonwoven material, the mixtures were formed from mixtures with a thickness of 2-3 mm in order to ensure an isotropic distribution of the mixture in the plane of the fabric. Webs from individual fibers were formed in the same way. The heating temperature was set from 160 to 220°C depending on the type of binder. Test specimens were cut with a double-sided blade with a base of 20 mm and a width of 5 mm.

High strength materials were demonstrated by the study's findings when polyamide was utilized as a binder. When non-woven materials take the place of polyamide, polypropylene, or high density polyethylene, the discontinuous elongation increases by about 1.3 times. Materials with a binding polyamide glue have four times the strength of those with low density polyethylene used as the binder. Nonwovens only partially survive on the fibers, mostly on the binder. When zones of destruction of samples were studied under a microscope, a similar outcome was achieved. We note in this regard that the values of the tensile strength of polyamide, polypropylene, high density polyethylene and low density polyethylene, measured at 20 ° C, is 34 MPa; 25 MPa, 22.7 MPa and 12 MPa, respectively [6,7].

The measured values of the destructive voltage (σr) and the relative elongation (εr) of nonwoven materials are shown in Table 1.

Table 1

№	The composition of the fibers, wt.%	Binder	Ϭ, MPa.	εr, %
1	Silk (100)	Low density polyethylene	8,6	74
2	Loven (100)	Low density polyethylene	6,2	103
3	Viscose (100)	Low density polyethylene	4,9	70
4	Silk Viscose (70:30)	Low density polyethylene	7,8	80
5	Silk (100)	High density polyethylene	19,7	375
6	Loven (100)	High density polyethylene	16,5	470
7	Viscose (100)	High density polyethylene	13,8	341
8	Silk-Loven (30:70)	High density polyethylene	18,0	420
9	Silk Viscose (70:30)	High density polyethylene	18,1	60

10	Silk (100)	polypropylene	18,5	408
11	Loven (100)	polypropylene	16,9	500
12	Viscose (100)	polypropylene	15,1	300
13	Silk-Loven (70:30)	polypropylene	18,8	410
14	Silk Viscose (30:70)	polypropylene	16,3	363

Based on the given data, it can be assumed that the main cause of the strength of non-woven materials on the basis of natural silk wastes compared with materials based on chemical fibers is due to the good adhesion of the binder precisely to the silk fiber[8-10]..

CONCLUSION

As noted in the work / 8-9 /, the use of natural silk or waste of natural silk allows to obtain materials with good thermal insulating properties. Consequently, the partial replacement of chemical fibers on natural silk waste is justified and allows to improve the physico-mechanical properties of non-woven materials obtained by the thermopressive method. This should be especially noticeable to manifest in nonwoven materials from viscose fibers. For example, a replacement of 30% viscose on natural silk waste will increase their strength.

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