



Scientific Substantiation of the Use of Sericin to Improve the Efficiency of Cotton Yarn Sizing

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ABSTRACT

The solid-state circuitry s and apparatus massive enhancement in in addition to the great development in engineering materials technologies, has led to the emergence of advanced kinds of electric motors such as stepper engines, frequency converter engines with Permanent magnet BLDC motors. Motors having brushless DC (BLDC) are increasingly popular as a modern choice of motor Due to its reliability, better dynamic response, silent operation and higher efficiency values, Its extremely low maintenance requirements and compact size make it the most demanding engine in a variety of practical applications. BLDC engine It likewise has a higher torque to volume proportion. The above benefits creat it reasonable in implementations with weight as well asspace are the fundamental variables to consider. These actuators might become monitored in either sensor mode or sensor-less form, however to decrease the general expense with volume of engine gathering, sensorless control procedures are by and large utilized. This paper gives a concise survey on the different control procedures utilized in BLDC engines.

Keywords:

Synthetic products, sizing, starch, development, chemical modification

At present, despite the availability of a number of synthetic products for sizing, the situation has not fundamentally changed. The share of starch sizing compositions reaches about 75%. The huge consumption of a valuable food product for the purpose of sizing not only causes significant damage to food resources, but is also a source of severe pollution of water bodies, since all the starch goes into wastewater during desizing. In this regard, the task of finding ways to reduce the starch content in adhesive compositions without reducing the quality of sizing becomes extremely urgent.

All the variety of proposed solutions to this problem can be divided into two main areas. The first is the development of new

technological methods of sizing, which can significantly reduce the amount of composition applied to the yarn, the second is the modification of sizing compositions.

The first direction, examples of which are the processes of sizing with foamed compositions, the mechanochemical method of preparing starch sizing, is associated with the need to re-equip production and, accordingly, with high capital costs.

Within the framework of the second direction, it is necessary to single out the chemical modification of starch itself and variations in the composition of sizing compositions.

As chemical modifiers of starch, low and high molecular weight amines and amides,

nitrile compounds, salts of acrylic acids, urea derivatives and other substances are used. The addition of functional groups to starch, the carriers of which are the listed compounds, improves its adhesive ability, increases the elasticity of the films formed and, accordingly, reduces the consumption of size.

As components of starch sizing compositions, which also help to reduce the consumption of natural biopolymer, plasticizers, surfactants, and adhesives are used [1-3].

Both starch modifiers and additives are synthetic, biologically difficult to decompose compounds that, as part of production waste, pollute the environment.

At the same time, there is a class of biopolymers of natural origin, completely non-toxic, whose molecular structure is characterized by an exceptional richness of fragments and functional groups. This class includes sericin, which is a waste product of silk-reeling factories. Such a protein-containing ingredient is released by boiling cocoons in the form of an aqueous solution, the concentration of sericin in which is 0.6-0.8%.

The noted features of the molecular structure of the biopolymer determine the presence of a number of properties in compounds of this class that make them promising in terms of possible use as an additive in starch gels to improve the quality of sizing [4-8].

First of all, these are the surface-active properties of sericin; the latter, but similar to surfactants, can increase the spreadability of starch films and the strength of their adhesive bond with the fiber. Secondly, this is the ability of sericin to interact with polymers. When using biopolymers as effective binders in polymeric adhesive compositions, which give adhesives a higher adhesive ability, while not reducing or even increasing their elasticity.

In addition, the involvement of sericin and synthetic polymer - PAA in the sizing polymer composition contributes to the sizing process without difficulty; the sizing does not stick on drying drums; it dries quickly on the threads, forming a smooth elastic film; glues individual fibers together.

Given the above, it seems reasonable to attempt to use sericin biopolymer additives in starch sizing compositions in order to reduce starch concentration and improve sizing efficiency [9-14].

Planned to evaluate the effect of sericin concentration on the relative viscosity of starch gels and the main indicators of the efficiency of yarn sizing at different starch content in sizing compositions.

The work was structured in such a way that the concentrations of both starch and sericin varied simultaneously, by random selection. This approach to conducting a search experiment is most appropriate, since it allows characterizing a wide field of parameters under study with a small number of experimental points.

The content of rice starch in the sizing composition was changed in the range from 4 to 6%, sericin from 0.1-0.3% (calculated on the mass of dry starch), PAA 0.05%.

PAA was included in the composition of the composition in order to somewhat reduce the effectiveness of the corrosion properties of the equipment by reducing the pH of the medium to neutral, because the composition of PAA contains up to 45% $(\text{NH}_4)_2\text{SO}_4$ which, as a result of hydrolysis, form an acidic environment. This contributes to a decrease in the pH of the medium from 10.7-7.5.

PAA concentrations in the sizing composition should not exceed 0.05% by weight of the sizing. An increase in the above concentration leads to a sharp increase in viscosity and this, in turn, contributes to film formation in the drum, which negatively affects the sizing process, i.e. due to film formation, the thread breaks in the process of passing through the combs of the sizing machine [15-17].

The introduction of sericin and PAA into the composition of the polymer composition leads to a decrease in the mobility of the starch macromolecule, i.e. limiting their thermal motion, increasing the structuring of the system and the formation of a more rigid chain, and, as a result, the viscosity of the system increases [18-19].

Conclusions.

1. The possibility of using PAA and sericin polymers in the composition as an effective sizing agent for a number of textile materials has been scientifically substantiated. As a result, it was possible to significantly reduce the used food raw materials - starch, while simultaneously increasing labor productivity by improving a number of technological characteristics, in particular, reducing thread breakage.

2. It has been established that the presence in the sizing composition based on rice starch, PAA and sericin has a positive effect on the process of gelatinization of sodium metasilicate starch and contributes to an increase in the viscosity of the system.

3. It has been established that the introduction of low concentrations of starch up to 5%, PAA - up to 0.05% and sericin (0.5% - solution) - up to 0.20% of the dry weight of starch into starch solutions improves the adhesion of the system to cotton fibers.

4. It is shown that sizing polymer compositions based on rice starch, PAA and sericin significantly increase the efficiency of a number of technological processes, in particular, sizing. At the same time, it was found that the breaking elongation of the sized yarn is inversely proportional to the amount of PAA and sericin. The optimal ratio of PAA and sericin has been found, providing tensile strength and breaking elongation corresponding to production requirements.

5. On the basis of comprehensive research and technological indicators, optimal compositions of sizing polymer compositions based on rice starch, PAA and sericin have been developed. The proposed polymer compositions based on starch and sericin have been successfully used as dressings under industrial conditions.

6. The use of this development in the process of sizing of cotton yarn made it possible to significantly reduce the consumption of starch (by 35-40%), as well as significantly simplify the technological process of preparing the dressing and increase the stability of the dressing during storage, and give the fibers a sufficiently high mechanical

strength. The addition of sericin to the polymer composition improves its adhesive ability, increases the elasticity of the films formed, which makes it possible to reduce the percentage of thread breakage during processing.

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