International Journal of Formal Education
Volume: 01 Issue: 09 | Sep – 2022 ISSN: 2720-6874
http://journals.academiczone.net/index.php/ijfe

Properties of Aqueous Solutions of the Polymer Composition and their Influence on the Effect

Hikoyat Inoyatovna Amonova
Associate Professor, Department of Medical Chemistry, Bukhara State Medical Institute, Candidate of Technical Sciences, The Republic of Uzbekistan

Abstract

An attempt was made to use sericin in order to increase the efficiency of cotton yarn sizing. The effect of sericin on the viscosity properties of sizing polymer compositions and the main sizing parameters was studied. The ways of reducing the starch content in adhesive compositions without reducing the quality of sizing are considered. The authors analyze studies of the influence of the nature and concentration of sericin on the physical and mechanical properties of cotton yarn. The article reveals the physical and mechanical properties of dressing and sized yarn.

Keywords: Manufacturing, textiles, development, sizing, chemical modification, starch.

Of significant interest is a significant improvement in the technological properties of sized yarn due to the partial replacement of the starch product in the dressing with a water-soluble synthetic polymer. But a serious obstacle to the practical use of such mixtures is the incompatibility of starch with most synthetic polymers. The incompatibility is the cause of separation of starch-based mixed dressing containing more than 20% of the synthetic component during storage without stirring. For practical purposes, as a rule, it is not necessary to achieve complete compatibility of polymers in the thermodynamic sense. In this regard, the concept of operational compatibility, one of the criteria for increasing which can be the improvement of the physical and mechanical characteristics of water-soluble polymer composite materials.

Water-soluble polymer compositions were prepared by mixing 5% starch gel with 0.5% aqueous solutions of sericin and polyacrylamide in a given proportion. The content of the water-soluble polymer polyacrylamide in the mixtures did not exceed 0.05% [1-5].

For all the water-soluble polymer compositions studied in the work, the mechanical and optical properties of films that were cast from solutions of the polymer composition were studied. For all

compositions of the polymer composition, an increase in the strength and transparency of the films was observed with an increase in the concentration of sericin in the composition. On rice unke 1.1. Dependences of the breaking load and optical transmission for films cast from the polymer composition starch: sericin - polyacrylamide are presented

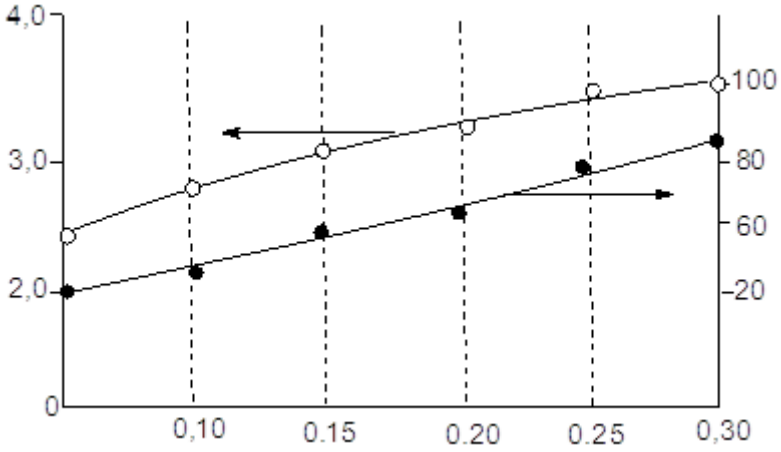
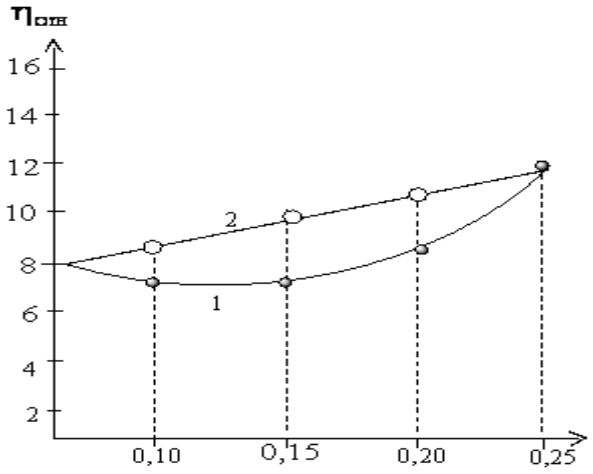


Figure 1.1. Dependences of the breaking load and optical transmission of the films of the composition on the concentration of sericin

Mixing two thermodynamically compatible polymers results in dispersion of one polymer in the matrix of the other. Dispersity, morphology, and adhesion between phases depend to varying degrees on interfacial energies, which play an important role in the formation of the mechanical properties of multiphase polymer mixtures. The presence of interfacial surfaces causes a "negative" deviation of the physical and mechanical characteristics of multicomponent polymeric materials from additive values [6-12]. Thus, an increase in the strength of films cast from a polymer composition indicates an increase in the compatibility of polymer components. The introduction of sericin into the composition of the polymer composition leads to a decrease in interfacial energies. An increase in the transparency of blended films can also indicate an increase in the compatibility of the components.

An increase in compatibility can also be judged by the change in viscosity of the composition as a result of the addition of sericin. It is known that for solutions of incompatible polymers, there is a compression of the structural elements of each polymer and, as a consequence, a negative deviation of the viscosity from the additive values. In Figure 1 . 2 shows the dependences of the viscosity of the solution of the polymer composition on their composition.

International Journal of Formal Education
Volume: 01 Issue: 09 | Sep – 2022 ISSN: 2720-6874
http://journals.academiczone.net/index.php/ijfe



Sericin concentration , % by weight of dry starch

Fig.1 . 2 . Dependence of relative viscosity of starch (1) and polymer composition (2)

The dotted line in the figure shows the dependence built on the viscosity values calculated according to the rules of additivity :

η_{cm} ¥u003d $s_1 \eta_1 + (1-s_1)\eta_2$,

(3.2)

where c_1 is the proportion of starch in the mixture,

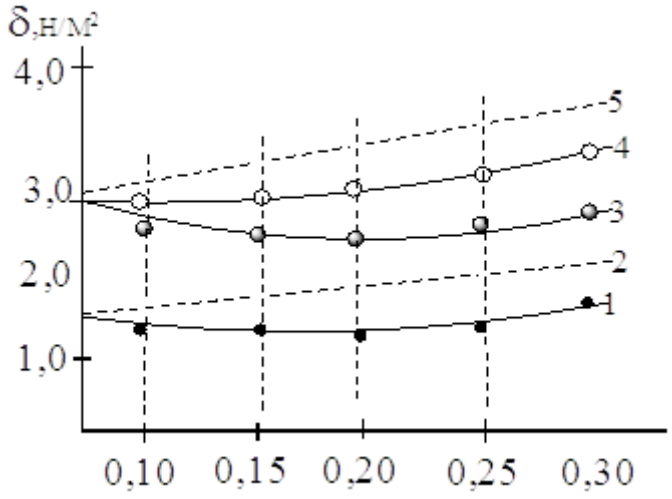
η_1 and η_2 - relative viscosities of aqueous solutions of starch and sericin .

A decrease in the negative deviation of the viscosity of solutions from the calculated additive values also indicates an increase in the compatibility of the components as a result of chemical treatment [13-18].

In Figure 1 . 3 (1,3 and 4) shows the dependences of the breaking load of films cast from the original starch (1), starch suspension with 0.2% sericin (3) and the composition on the content of sericin 0.2% and PAA -0.05% (four).

The initial values of breaking loads for films from water-soluble polymer compositions turned out to be higher than for films from starch and polyacrylamide, so the calculated dependences 2 and 5 in Figure 3.1 do not coincide.

International Journal of Formal Education
Volume: 01 Issue: 09 | Sep – 2022 ISSN: 2720-6874
http://journals.academiczone.net/index.php/ijfe



Starch concentration

For films of starch (1), for films of starch- sericin (3) and for films of starch a- Polyacrylamide - sericin (4). 2.5 - effective dependences for the initial starch (2) and the polymer composition (5).

Fig.1 .3. Dependences of the breaking load of films on the composition of the composition

As can be seen from Figure 1.3. Negative deviation of breaking loads from additive values for films cast from starch and

sericin a - Polyacrylamide , more than for starch- sericin films . It can also be seen from the figure that in the case of a polymer composition, the deviation from the additive dependence is smaller than in the case of individual components before mixing. One of the reasons for this experimental fact can be the homogenization of the mixture and the increase in the level of dispersion of the system as a whole.

Table 1. one Changes in the physical and mechanical properties of yarn when sericin is introduced into the dressing . The content of PAA in the composition is 0.05%.

The composition of the sizing compositions, %		The ratio of starch and preparations in dressing,%	discontinuous load P , cN	Discontinuous _ elongation E, %	Pr ikley TO, %
Starch	Sericin _				
5	-	100:0	356	3.7	5.7
	0.1	99.5:0.5	381	3.1	5.6
	0.2	99.0:1.0	388	3.1	5.3
	0.3	98.5:1.5	402	3.4	5.4
	-	100:0	365	3.4	6.6
	0.1	99.4:0.6	386	3.5	6.0

6	0.2	98.8:1.2	392	4.0	5.2
	0.3	98.2:1.8	404	4.4	5.2
7	-	100:0	382	4.5	5.5
	0.1	99.3:0.7	410	4.5	5.6
	0.2	98.6:1.4	422	4.6	5.8
	0.3	97.9:2.1	434	4.7	5.9

The content of starch and sericin in dressing depends on the type and properties of the cotton yarn being spun, as well as on the conditions of its processing . Therefore, the initial study was directed to the selection of concentrations of starch, polyacrylamide and sericin in the composition [19-24]. The test results of sized cotton yarn using starch, polyacrylamide and sericin are shown in table 1.1.

As can be seen from this table 1.1. , the values of the breaking strength, elongation at break and glue depend significantly on the size composition. The use of the developed polymer composition based on rice starch, polyacrylamide and sericin in sizing cotton yarn made it possible to increase its strength, reduce elongation at break, and this, in turn, helps to reduce yarn breakage.

The viscosity of sizing systems is one of its main characteristics.

Table 1.2. The composition of the composition and the change in the viscosity of the solution at 298 K

Starch rice , _ %	PAA, %	Viscosity of starch and PAA solution, Pa s	Change in the viscosity of the solution (Pa·s) at the concentration of sericin ,% of the mass of dry starch			
			0.10	0.15	0.20	0.25
5	0.03	0.90	1.10	1.21	1.30	1.45
	0.05	1.03	1.24	1.34	1.47	1.76
	0.07	1.18	1.36	1.57	1.70	2.11
	0.10	1.52	1.72	1.98	2.33	2.72
6	0.03	1.05	1.20	1.34	1.52	1.70
	0.05	1.22	1.41	1.56	1.78	2.04
	0.07	1.33	1.52	1.69	2.01	2.20
	0.10	1.53	1.77	2.11	2.47	2.70
7	0.03	1.25	1.29	1.48	1.58	1.82
	0.05	1.28	1.51	1.71	1.93	2.18
	0.07	1.58	1.69	1.92	2.18	2.42
	0.10	1.78	1.98	2.24	2.71	2.94

It should be within the optimal values, which ensure the formation of a protective film on the surface of the yarn, which gives it strength and elasticity.

The composition and data on the change in the viscosity of the solution of the composition at various concentrations of the components are presented in table 3.5. The study of the dependence of the viscosity of a system of 5-7% starch paste and 0.03-0.10 % PAA containing sericin in the range of 0.10-0.25% showed that all the studied solutions have sufficient viscosity. At the same time, with an increase in the concentration of sericin from 0.10 to 0.25% in starch paste, as shown in the works of Khafizov A.R. and Amonova M.R. there is a significant change in the structural and mechanical properties of the system.

Table 1.3. Strength indicators of yarn sized with various compositions polymer compositions

Composition composition, %				solution pH _	discontinuous load yarn, cN	discontinuous elongation yarn, %	glue, %
Starch	PAA	Sericin _	Oil clap .				
5	0.03	0.15	0.03	7.2	271	2.3	2.6
	0.05	0.15	0.03	7.1	284	2.4	3.2
	0.07	0.15	0.03	6.8	295	2.6	3.4
5	0.03	0.20	0.03	7.3	280	2.2	3.2
	0.05	0.20	0.03	7.0	298	2.3	3.6
	0.07	0.20	0.03	6.6	305	2.5	3.8
5	0.03	0.25	0.03	7.6	302	2.0	3.7
	0.05	0.25	0.03	7.1	324	2.4	3.9
	0.07	0.25	0.03	6.5	342	2.4	4.1

As seen in Table 1.3. Discontinuity characteristics of sized yarn are significantly influenced not only by the content of starch and polyacrylamide in the composition, but also by sericin .

For example, if the breaking load of cotton yarn with 5% starch, 0.03% polyacrylamide and 0.15% sericin is 271 cN , then with the same starch and PAA content and increasing the sericin content to 0.25%, the breaking load will increase to 302 cN , i.e. by 24%. Thus, it has been experimentally established that compositions based on starch, polyacrylamide and sericin satisfy the requirements for adhesive and film-forming dressing components [25-34].

Thus, a technology has been developed for obtaining polymer compositions based on starch, sericin and PAA for sizing cotton yarn. When using this development, starch consumption is reduced by 25%; the viscosity of the experimental dressing was within the normal range; the technology of preparation of dressing of the new composition corresponded to the existing one; in the process of sizing the base with experimental dressing, no complications were observed; the physical and

mechanical properties of the yarn after sizing with experimental dressing corresponded to the norm; warp breakage is lower than 35 % than at the factory.

The production of a pilot batch of cotton yarn, sizing with developed polymeric compositions, which fully meet the requirements of the technical standard and documentation, was carried out. Based on the data obtained, a technological regulation for the production of sizing of cotton yarn was developed.

References:

1. Tomasik P., Schilling R. Modification of starch by IR emanation.// Advances in Carbohydrate Chemistry and Biochemistry; 2004, 59, p.19.
2. Padokhin VF, Blinichev VN, Lipatova IM, Moryganov AP Synergetic aspekt of mechano-chemical technologies for producing gel-forming polymer materials with optimal propertiees .//IIV Int. Conf. The problems of solvation and complex formation in solutions. June 29- July . 2008. Ivanovo . Russia . p . 401.
3. Kirillova MN, Scheglova TL, Belokurova OV, Katkov IV, Evaluation of the effectiveness of new dressing compositions based on starch. Textile Chemistry, 1 (5) 2007.S. 76-78.
4. Dumitrash PT , Spiders Yu.N. Experimental - industrial testing of the process of obtaining dressing in the field of elastic vibrations. Thes . doc . Room Conf. On textiles and leather. - Iasi. Romania. May 14-16. 2012. S. 19.
5. Gandurin LI, Lopatina OP Trends in the development of sizing, taking into account environmental and resource-saving problems // Zh.Teks.prom . – 2009 .- No. 7. - S. 54.
6. Khajieva I. et al. Foreign language competenceformation of the future teacher of vocational education in the information and educational environment //European Journal of Molecular & Clinical Medicine. – 2020. – Т. 7. – №. 2. – С. 360-365.
7. Жабборова О. И., Кенжаева Х. П. Экологические мировоззрения Ибн Сины //Международный журнал гуманитарных и естественных наук. – 2018. – №. 5-2.
8. Кенжаева Х. П., Тожиев Ф. И., Жураев Б. Н. РОЛЬ ЖЕНЩИН В СОЗДАНИИ И РАЗВИТИИ ДЕМОКРАТИЧЕСКОГО ОБЩЕСТВА В УЗБЕКИСТАНЕ //Инновации в технологиях и образовании. – 2014. – С. 119-123.
9. Zhabborova O. I., Kenjaeva H. P. Bases of gender equality of rights in Uzbekistan //Международный журнал гуманитарных и естественных наук. – 2018. – №. 5-2.
10. Хуршида Кенжаева (2022). ИЖТИМОИЙ ФАОЛИЯТ ИНСОН ВА ЖАМИЯТ ТАРАҚҚИЁТИНИНГ ОМИЛИ. Scientific progress, 3 (1) 862-867

11. Кенжаева, Х. П. (2021). Сиёсий-Ҳуқуқий Маданиятни Ошириш Омиллари. *Ижтимоий Фанларда Инновация онлайн илмий журнали*, *1*(6), 94-97.
12. Кенжаева, Х. П. (2021). Сиёсий Тизимни Ислоҳ Қилиш Омиллари. *Таълим ва Ривожланиш Таҳлили онлайн илмий журнали*, *1*(6), 199-202.
13. Кенжаева, Х. (2021). Миллий маънавий меросимизда таълим-тарбия масалалари. *Общество и инновации*, *2*(6/S), 18-24.
14. Кенжаева Х. П. ФУҚАРОЛИК МАДАНИЯТИ МЕЗОНЛАРИ ШАРҚ ФАЛСАФАСИ ТАЛҚИНИДА //Academic research in educational sciences. – 2021. – Т. 2. – №. 3.
15. Kenjaeva, X. P., Tojiev, F. I., & Juraev, B. N. (2014). ROLE OF WOMEN IN CREATION AND DEVELOPMENT OF DEMOCRATIC SOCIETY IN UZBEKISTAN. *Innovations in technologies and education*, 119-123.
16. Кенжаева, Х. П., & Каримова, Л. М. (2019). ТАРИХИЙ ХОТИРА–ХАЛҚ МАЪНАВИЯТИНИНГ ТАРКИБИЙ ҚИСМИ. *ПЕРЕКРЁСТОК КУЛЬТУРЫ*, *1*(3).
17. Кенжаева, Х. П. (2021). Аёллар ижтимоий фаоллигини оширишда фуқаролик институтларининг ўрни. *Scientific progress*, *1*(6), 957-961.
18. Pulatovna, K. K. . (2022). Technologies and Conditions for the Implementation of Innovative Processes. *Spanish Journal of Innovation and Integrity*, *5*, 610-615.
19. Pulatovna, K. K. (2022). Main Directions for Reforming the Educational System in the Republic of Uzbekistan. *European Multidisciplinary Journal of Modern Science*, *6*, 276-281.
20. Кенжаева, Х. П. (2022). ФУҚАРОЛИК ЖАМИЯТИ ВА ИНСОН ҲУҚУҚЛАРИ.
21. Higazy A., Bayazeed A., Hebeish A .. Synthesis and Applications of Reactive Carbohydrates Part II: Graft Polymerization of Starch and Hydrolyzed Starches with Acrylamide// Starch – Starke, 1987, Vol. 39, 9, p.319-322.
22. Lipatova I.M., Padokhin V.A. et al. Mechanochemical technologies for obtaining modified starch thickeners // Textile chemistry. 1997.- No. 3 (12).- P. 60-61.
23. Lipatova I.M., Nuzhdina I.V. New thickening and sizing preparations based on mechanochemically modified starch. // Vestnik MGTA. -1994. -#2, -p.107-111.
24. Lipatova I.M., Yusova A.A., Ermoleva N.A., Moryganov A.P. Influence of intense mechanical influences on the rate of oxidation of polysaccharides with potassium permanganate.//Textile chemistry. -1995.- No. 2(7).- P. 85-89 .
25. Padokhin VF, Blinichev VN, Lipatova IM, Moryganov AP Synergetic aspekt of mechano-chemical technologies for producing gel-forming polymer materials with optimal properties

.//IIV Int. Conf. The problems of solvation and complex formation in solutions. June 29- July . 1998. Ivanovo. Russia. p. 401.

26. Наврузова, Н. О., Ихтиярова, Г. А., Каримова, Г. К., Наврузова, У. О., Шукуров, И. Б., & Аманова, Х. И. (2019). Современные диагностические методы для раннего выявления заболеваний шейки матки. *Доктор ахборотномаси*, (4), 77-82.
27. Амонов, М. Р., Раззоков, Х. К., Равшанов, К. А., Мажидов, А. А., Назаров, И. И., & Амонова, Х. И. (2007). Исследование релаксационных свойств хлопчатобумажной пряжи, ошлихтованной полимерными композициями. *Узбекский химический журнал*, (2), 27-30.
28. Яриев, О. М., Амонов, М. Р., Амонова, Х. И., & Мажидов, А. А. (2007). Оценка реологических свойств полимерной композиции на основе природных и синтетических полимеров. *Композиционные материалы: Научно-технический и производственный журнал*, (1), 6-10.
29. Shukurov, I. B., & Amonova, H. I. (2020). Glutathione metabolism and its state in acute pancreatitis depending on the body's antioxidant status. *EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH. ejpmr*, *7*(3).
30. Амонова, Х. И., & Содикова, С. Ш. (2020). Кейс как эффективный метод преподавания химических наук в высших медицинских учебных заведениях. *Вестник науки и образования*, (19-2 (97)), 52-54.
31. Ихтиярова, Г. А., Таджиходжаев, З. А., Ахматова, Д. А., & Амонова, Х. И. (2013). Загустки на основе карбоксиметилкрахмала и акрилатов для набивки тканей. *Кимё ва кимё технологияси.-Тошкент*, (4-С), 65-67.
32. Амонова, Х. И., Равшанов, К. А., & Амонов, М. Р. (2008). Оценка возможности применения серицина для повышения эффективности шлихтования хлопчатобу-мажной пряжи. *Композиционные материалы*, (4), 66-68.
33. Амонова, Х. И. (2008). Реологические свойства водных растворов полимерной композиции и их влияние на шлихтующий эффект. *Композиционные материалы*, (2), 32-36.
34. Аманов, М. Р., Содикова, С. Ш., Амонова, Х. И., & Ихтиярова, Г. А. (2007). Влияние соотношения компонентов полимерной композиции на свойства загустей. *Пластические массы*, (7), 45-46.