PHYSICAL-MECHANICAL PROPERTIES OF INTERPOLYMER COMPLEX FILM BASED ON SODIUM CARBOXYMETHYL CELLULOSE AND POLYACRYLAMIDE

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ABSTRACT

Innovative developments serve the integration of science and production. Uzbekistan, which has a highly developed production and processing industry, has a large amount of resources for obtaining new polymer materials of great practical importance. This brings not only the production of valuable products, but also the study of their processing technologies to the level of today’s urgent issue.

INTRODUCTION

Polyelectrolytes consist of a number of ions or ionic groups, and the most basic are charged macromolecules that dissolve in water. In a solution with a certain environment, the ionic groups of the polyelectrolyte dissociate into oppositely charged polyions and several small ions, and rely on counterions aimed at neutralizing the charge in the repetitive parts of the macromolecule while maintaining electroneutrality.

In the case of polyanions, if there is salt in the solution, they are called oppositely charged positive ions, the ions with the same charge form cations, just like polyions. Although polyelectrolytes (polyelectrolyte) are not negatively charged (polyanion, polyacid) or positively charged (polycation, polybase), they can also be positively charged (polyampholytes). A simple polyelectrolyte can be a homopolymer in which each link carries one type of ionic group.If such a group is a strong acid or a strong base, then its charge density does not depend on pH, such polyelectrolytes are called polyelectrolytes with a constant charge. If the ionic group is a weak acid or a weak base, the pH depends on the nature of the solution, and such polyelectrolytes are called polyelectrolytes with variable charge. Most complex polyelectrolytes are copolymers, that is, only a fraction of the monomers carry charged groups. Most typical polyelectrolyte nature can be found in situations where more than one ionic site per monomer corresponds to ten monomer units.The nature of the solution mainly depends

a) linear, b) branched, c) mesh-like
picture. Molecular structure of polyelectrolytes.

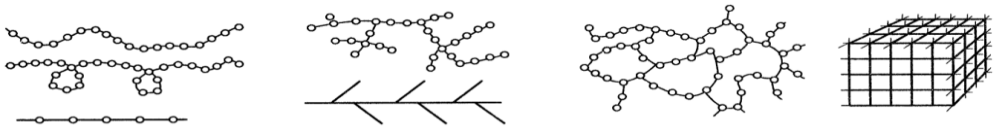
on the solubility or insolubility of the non-ionic comonomer in water. The molecular structure of polyelectrolytes can be linear, branched or mesh-like, respectively.

Research methodology. Obtaining polycomplex and polycomplex composites based on sodium-carboxymethylcellulose (Na-KMS) and polyacrylamide (PAA) and films based on them, their study and application to production is one of the urgent issues.

Before use, Na-KMS was cleaned from lower molecular compounds, various additives and impurities.Na-KMS is a weak polyacid, its dissociation constant depends on the degree of substitution.It has good solubility in hot and cold water and has a high coefficient of internal friction when its concentration is higher. It exhibits the property of polyelectrolyte in aqueous solution and it is approved for wide use in medicine, pharmaceutical and food industry as a thickener and binder of medicines and food products.

A 2% aqueous solution of Na-KMS was prepared to obtain interpolymer complex film films based on sodium carboxymethylcellulose and polyacrylamide. An interpolymer complex film was obtained by mixing it with an aqueous solution of polyacrylamide with a concentration of 2%, the pH value of which is equal to 7, and the pH value is 6.2, in a neutral and weakly acidic environment. It was found that there is an interaction between the carboxylate anion group in sodium carboxymethylcellulose and the amine group in polyacrylamide. A widely used potentiometric titration method was used to study the course of the reaction between Na-KMS-PAA, that is, the process of interpolymer complex formation. When Na-KMS solution is titrated with polyacrylamide in a neutral and weakly acidic medium, the experimental results showed the formation of a polyelectrolyte complex.

One of the main ways to expand the field of application of polymers, to create the desired properties in them, is to modify these polymers. An important method of polymer modification is obtaining polymer complex films.It has been found that in polymer complex films, components with different properties can create new, original properties when they coexist, or individual component properties can be directed to a specific purpose. For example: polymer-based complex films are successfully used in the formation of various fibers, as a layer for microcapsules, in medicine as a drug carrier.



Homopolysaccharides are named by adding the suffix -an to the name of the reducing monosaccharide in them. For example, glucans and

mannans.Heteropolysaccharides are called mannoglucans if they contain mannose instead of branched monosaccharide. Important physiological homopolysaccharides include starch and glycogen, while hyaluronic acid, chondroitin sulfate, and heparins can be cited as representatives of heteropolysaccharides.

Results and its discussion. Films and coatings for ointments have attracted renewed interest in the industry of ointments. Na-KMS and PAA are being studied as a promising strategy to improve the mixing properties. properties. The mixture of NA-KMS and PAA formulated by design is evaluated for physico-mechanical properties to understand the effect of individual components. The matrices studied about the final performance of the film showed good film-forming ability. and environmentally friendly technology focused on easy processing properties. Lubricants have attracted great interest for research on films and coatings for pharmaceutical applications. In the same way, in this research work, as above, a new individual substance based on sodium carboxymethylcellulose (NA-KMS) and polyacrylamide (PAA), which are considered to be polyelectrolytes that are known to science, are cheap and produced in local enterprises. - an interpolymer complex film was obtained. The experimental results showed that the physico-mechanical properties of interpolymer complex film solutions obtained on the basis of Na-KMS and polyacrylamide depend on the amount of the two interacting components. It can be observed that adding polyacrylamide solution to Na-KMS solution increases their internal friction coefficient and after equimolar amount, internal friction coefficient increases sharply. Physico-mechanical studies of single-layer Na-KMS and PAA interpolymer complex film samples with different proportions determined tensile strength, deformation and shear modulus on the "SHIMADZU" AG-X Plus testing machine.

Stretching speed -1 mm/min up to 0.3% deformation value, then -30 mm/min., initial length l-100 mm, width d-15 mm, thickness b- 0.18 to 0.22 mm was, room temperature 20 0C. the samples were checked in working mode. The calculation was made according to the following formula:

$$A_0 = b \cdot d$$

A_0 - cross-sectional area, b - thickness, d - width of samples.

$$\sigma = \frac{F}{A_0}$$

σ-breaking strength, F-upload,

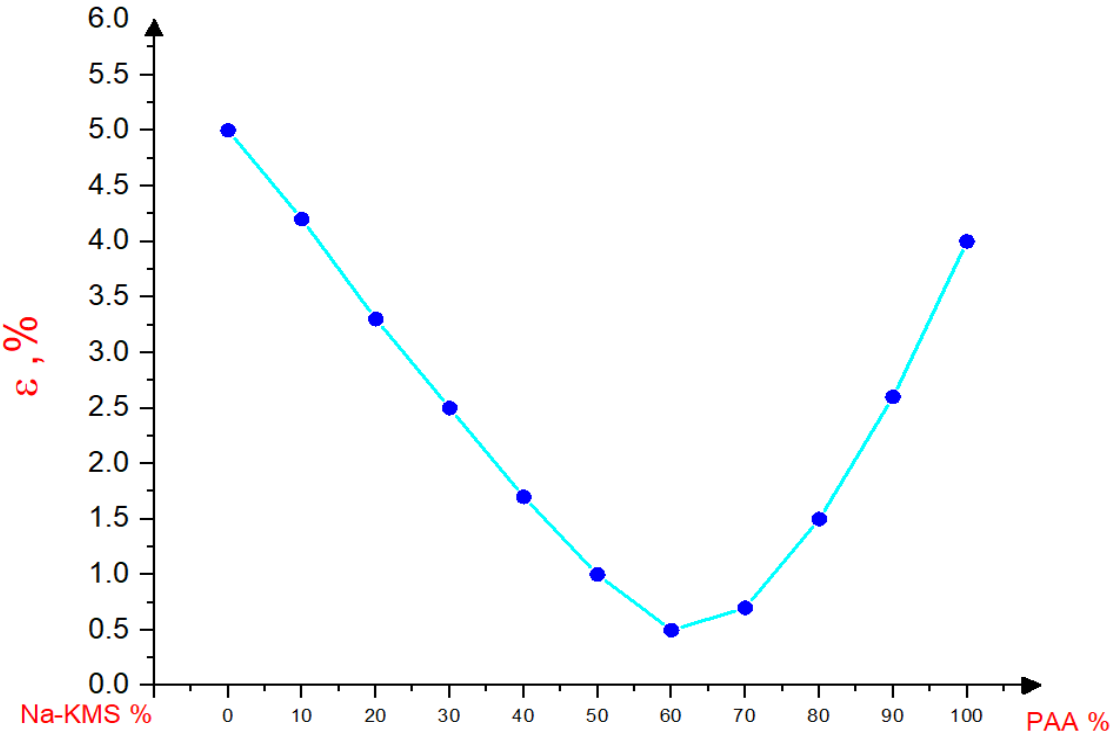
$$\varepsilon(\%) = \frac{\Delta l}{l} \cdot 100\% \ ,$$

ε-relative elongation at break,l - is the initial length, Δl-absolute deformation. We used the above formulas to calculate the relative elongation, tensile strength and cross-

sectional area. We can determine the regularity between the elastic modulus common to all solutions and the composition of the solution by depicting the obtained results graphically. Modulus of elasticity is the general name of several physical quantities that describe the ability of a solid body (material, substance) to elastically deform (ultimately regain its original shape after the force is applied) when a force is applied to it.

$$E = \frac{d\sigma}{d\varepsilon}$$

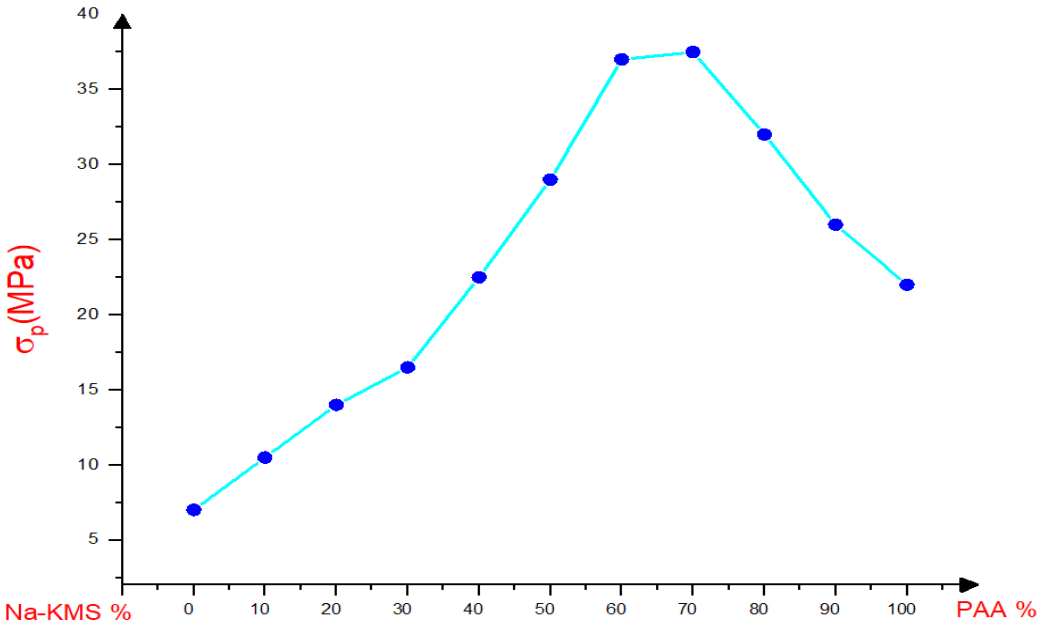
In the area of elastic deformation, the modulus of elasticity of the body depends on the stress as a whole, and is determined by the derivative (gradient) of the dependence of the stress on the deformation, that is, the tangent of the slope of the initial line section.



NA-KMS and PAA's quantitative ratio

Picture: The elastic modulus of the interpolymer complex film obtained on the basis of Na-KMS and PAA and the graph of dependence on the composition of the solution.

The interpolymer complex film formed in neutral and weak alkaline environment shows that the elastic modulus is low in these solutions mainly due to the weak electrostatic bond between the carboxylate anion in Na-KMS and the amine group in PAA.



NA-KMS and PAA's quantitative ratio

Picture: Graph of dependence of the maximum tension of the interpolymer complex film obtained on the basis of Na-KMS and PAA and the composition of the solution.

CONCLUSION

For the first time, a new interpolymer complex film based on sodium - carboxymethylcellulose and polyacrylamide polyelectrolytes, produced domestically, inexpensively, on an industrial scale, was obtained and studied.The formation mechanism and physical-mechanical properties of the obtained interpolymer complex films were studied and analyzed.Processes of forming the structure of interpolymer complex films based on sodium carboxymethylcellulose and polyacrylamide polyelectrolytes were studied and analyzed.The bonding of interpolymer complex films based on sodium carboxymethylcellulose and polyacrylamide polyelectrolytes was confirmed by potentiometric titration, electrical conductivity and IR-spectroscopic methods. It was determined that the structure and properties of interpolymer complexes can be controlled by changing their quantitative ratios.Based on the experimental results of the water-soluble interpolymer complex and interpolymer complex films obtained on the basis of sodium carboxymethylcellulose and polyacrylamide polyelectrolytes, it was proposed to use it as a basis for the preparation of topical drugs.Based on sodium carboxymethylcellulose and polyacrylamide polyelectrolytes, the production of polycomplex and interpolymer complex films with previously known structure and properties was substantiated.

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