Kuchynska Daria
Kyiv National University of Technologies and Design
(Kyiv)
Scientific supervisor – Horlatova Olena

MECHANICAL PROPERTIES OF FILMS BASED ON MODIFIED STARCHES

Polysaccharides - one of the most important groups of biopolymers. They are part of the tissues of animals, plants and microorganisms. The general formula is CnH2mOn. Starch is a natural organic substance, takes second place in the use after cellulose. It is formed in the leaves and stalks of plants as a result of heavy biochemical processes, initiated by the photosynthesis of carbon dioxide and water. Starch is used most widely from natural polymers in compositions [1]. Starch is used as a natural filler in traditional plastics and especially in polyolefins [2]. In a pure form, starch is not a film-forming substance, therefore its processing is possible only in conjunction with plasticizers. Since starch is a typical hydrophilic polymer, it can contain up to 30-40% of bonded moisture. This property allows you to use water as one of the most available starch plasticizers. Such plasticization is carried out at the same time as the temperature and mechanical stress. As a result, there are significant changes in the physical and mechanical properties of starch. Glycerol and oligomeric polyglycols also make a plastering effect on starch [3].

When performing the tasks, methods of studying the physical-mechanical characteristics of a destructive machine were used. The following materials were used in the studies: PVA, gelatin, starch, glycerol, water, decane.

Materials based on modified polysaccharides (cellulose, starch) belong to the class of physiologically active polymers and have better properties than synthetic polymers that can negatively affect the body through its molecular

structural elements. The use of polysaccharides in medicine is due to their high physical and mechanical properties.

The following materials were used in the studies: modified food starch (DSTU 3976-2000), PVA grade 16/1 (mass fraction of acetate groups, not more than 0,9-1,7%), glycerin and decane. The thickness of the films was determined by micrometer MRI 25-50 (0.001mm). The thickness of the films based on modified edible starch was 0.2-0.5 cm. The strength of the gap and the relative elongation were determined according to GOST «Polymer films. Method of testing for stretching». [4] The films were poured out of solution. The resulting mixture has the appearance of a viscous solution, which is applied to the substrate. Then the samples are further dried at 40-50 ° C, after which the samples are thermostabilized in a drying cabinet at 100-120 ° C. The composition of the films studied is given in Table 1.

Table 1

Composition of the studied films

№	PVA	Modified starch	Glycerol	Decacane
1	25	75	+	-
2	50	50	+	-
3	75	25	+	-
4	25	75	+	+
5	50	50	+	+
6	75	25	+	+

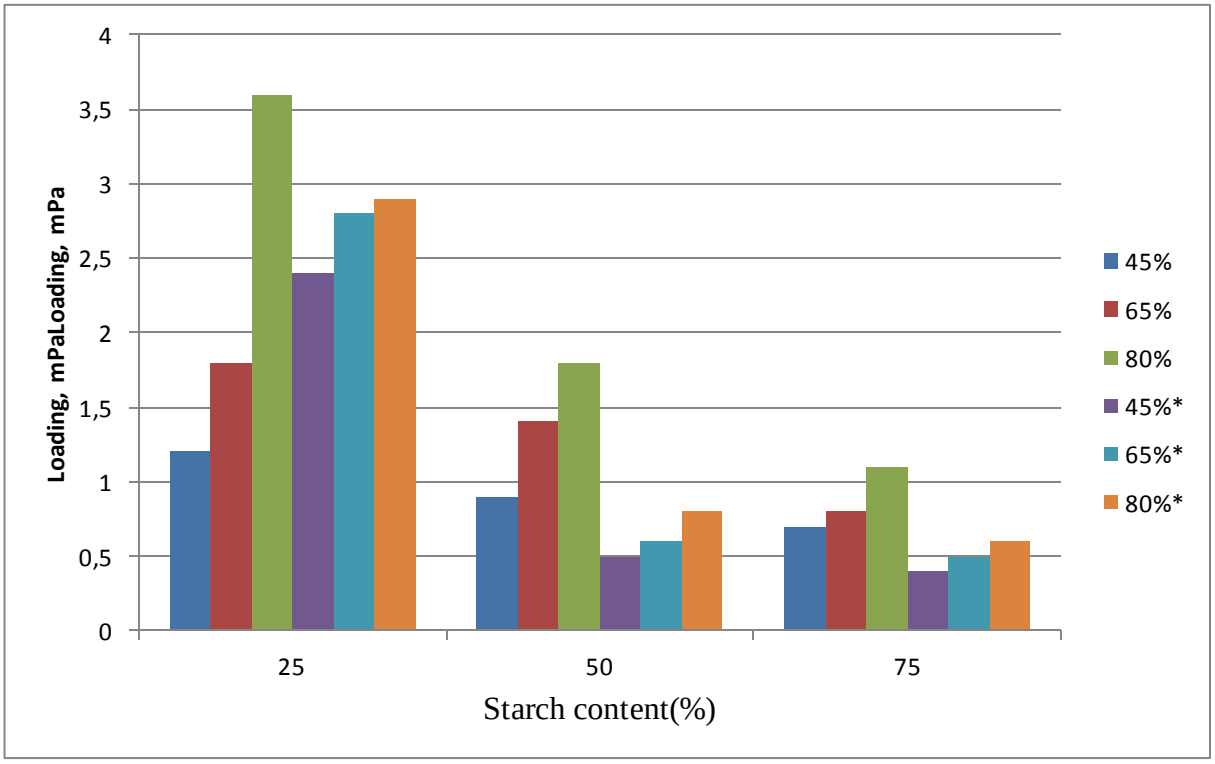
The tensile strength and relative elongation at rupture for specimens of different humidity from humidifiers with a humidity of 45.65 and 80% were carried out. The measurements are listed in Table 2.

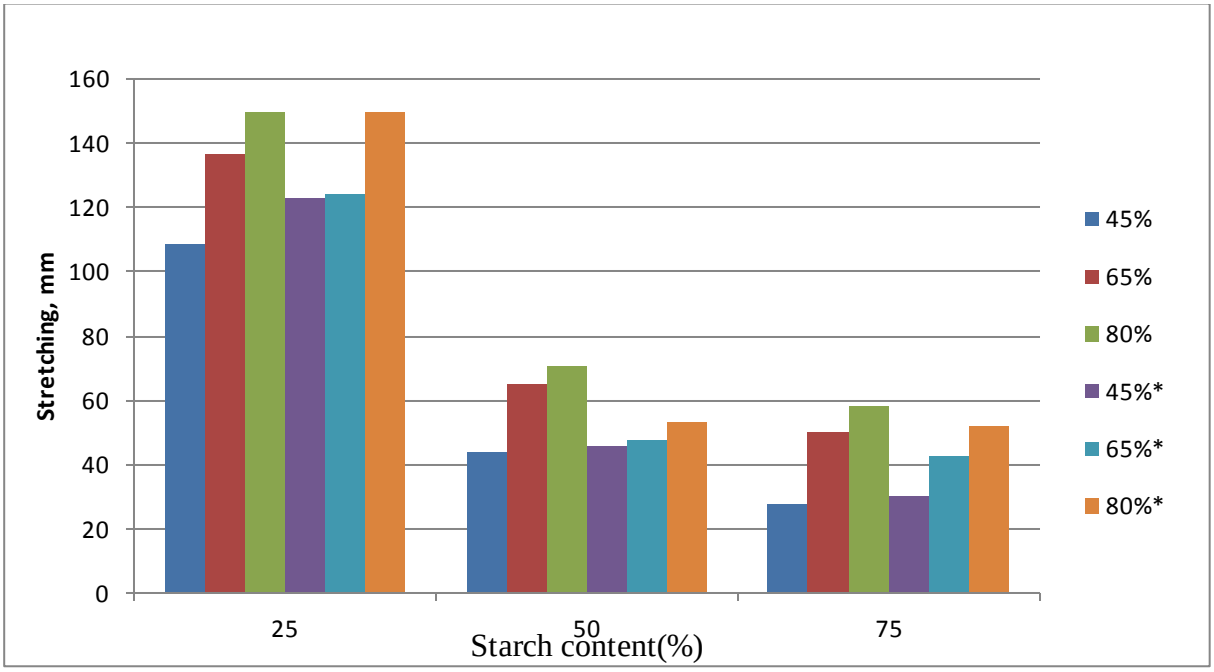
Table 2

Investigation of physical and mechanical properties depending on the moisture content of the samples

Moisture	Loading, mPa						Stretching, mm					
№	1	4*	2	5*	3	6*	1	4*	2	5*	3	6*
45%	0.7	0.4	0.9	0.5	1.2	2.4	28	30	44	46	108.5	123
65%	0.8	0.5	1.4	0.6	2.5	2.8	50	43	65	48	137	124
80%	1.1	0.6	1.8	0.8	3.6	2.9	58	52	71	53	150	150

Characteristics of the dependence of physical and mechanical properties depending on the content of starch





Note: * - samples with decacane.

PVC-based material with the addition of natural polymers and medical preparations has a prolonged action, is easy to adjust to their elastic properties; of these, active substances are well released and absorbed. Thanks to the experimental data, it was investigated that increase in the percentage of PVA has a positive effect on the physical and mechanical properties of the film, and the addition of an antiseptic reduces the quality of the samples for stretching and loading. The best physico-mechanical properties were samples of numbers 3 and 6.

REFERENCES

1. Vlasov S.V .Biodegradable polymer materials / S.V. Vlasov, A.A. Olkhov // Polymer materials. - 2006. - №10. - p. 28-33.

2. Pharmaceutical and medico-biological aspects of drugs / Ed. prof. I.M. Pertseva - Vinnitsa, New Book, 2007. - 728 p

3. Leon P.B.M. Janssen, Leszek Moscicki. Thermoplastic starch as packaging material. – Acta Sci. Pol., Technica Agraria 5(1), 2006.

4. GOST 14236-81 «Polymer films. Method of stretching test» - July 1, 1991. - Moscow: Gosstandart of Russia, 1991. - 8 p.