EFFECT OF CHITOSAN SUBSTANCE WITH DIFFERENT MOLECULAR WEIGHTS ON PAPER QUALITY

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ANNOTATION

The study examined the use of low and medium molecular weight chitosan to reduce the water-absorbing properties of paper and increase its strength and smoothness.

Key words: *chitosan, paper, cellulose, water absorption, strength, smoothness.*

To improve paper properties, chitosan is added to paper and used to improve its derivatives. In both cases, chitosan mainly improves the strength of paper sheets. By using chitosan and its derivatives in the paper industry, a number of quality indicators have been improved. In particular, it was shown that it leads to improvement of strength properties of old paper sheets. When adding chitosan and its derivatives to the cellulose mass, the breaking length of the obtained fibers increased several times. On the other hand, when the paper was immersed in solutions of chitosan and its derivatives, the opposite trend was observed for the tearing factor. In general, it was shown that the mechanical properties were improved by using chitosan in paper production. Chitosan and its derivatives also improve electrical, printing, barrier and antibacterial properties of paper.

Nowadays, paper and paper products are used in many cases for packaging various items and products. Therefore, it is important to obtain papers with high dry and wet strength, low water absorption and high tear resistance properties.

The purpose of the work is to study the effect of chitosan with different molecular weight on the quality indicators by introducing it into the paper.

Chitosan samples (low molecular weight and medium molecular weight) were characterized for their ash content, molecular weight and degree of deacetylation for paper production. It was known from previous experiments that the higher the level of diacetylation of chitosan, the faster it reacts. Taking this into account, the chitosan diacetylation level of 95% was selected for the experiment. During the research, samples were obtained by adding low molecular weight and medium molecular weight chitosan to paper pulp. Paper samples were taken on the basis of cotton wool and basalt fiber. 1% and 2% solution of chitosan was used.

Table 1

Strength and elasticity of paper

№	Change (diversity)		Resistance to interruption(kN/m)	Flexibility(%)	Grammage (g/m^2)	Tear resistance of paper (Nm/g)
	Filler % (basalt fiber)	Chitosan(%)				
Lower molecular mass (weight)						
1	-	1	4.8	4.2	100	60.07
2	-	2	3.5	3.7	100	43.26
3	25	1	3.5	3.2	100	39.26
4	25	2	3.0	3.8	100	51.98
5	35	1	4.6	4.2	100	56.86
6	35	2	3.8	3.4	100	42.98
Average molecular mass (weight)						
1	-	1	4.3	2.8	100	51.78
2	-	1	4.2	3.2	100	47.85
3	25	1	4.5	3.3	100	53.97
4	25	2	4.1	3.1	100	48.27
5	35	1	4.8	3.5	100	60.30
6	35	2	4.6	3.1	100	59.39

The use of chitosan improved the dry strength of the paper, especially by adding 1% low molecular weight chitosan. But the increase in concentration reduced its dry strength. This can be explained as follows. The connection must correspond to the distance between the segments between the fibers, because they form an inter-fiber connection area. Even if the water molecule is separated from the organic bond with the fibers or not, a large amount of water destroys the bond state of the paper. It can be explained that the hydrogen bond on the fiber surface is mainly monopolized by the water molecule, because the fiber forms a macroscopic liquid bridge. The weakness of this bridge indicates the wet tensile strength of the paper. To conclude this research work, they found that low molecular weight chitosan was more effective than medium molecular weight chitosan in all cases of using chitosan in the papermaking process.

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