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OBTAINING A CHEMICALLY RESISTANT COMPOSITION BASED ON BUTADIENE-NITRILE RUBBER

Abstract: *SKN-40 rubber is compatible with other ingredients, mixes quickly and improves the physical and mechanical properties of vulcanizate. For this purpose, based on standard indicators, it is necessary to prepare a rubber mixture based on comparative dioctylphthalate, dibutylphthalate and their combination and to study its physical and mechanical properties by vulcanizing it. In the laboratory, it is possible to synthesize diphenylolpropane dicaprylate and diphenylolpropane oxypropylene esters on the basis of naphthenic acids and use it as a plasticizer in SKN-40 rubber. Using this new plasticizer synthesized is to obtain rubber resistant to aggressive environments. The following issues have been resolved to achieve the set goal:*

- preparation of polymer compositions using new types of plasticizers;

- research of technological parameters of polymer-plasticizer system, study of interfacial field, structure and properties of polymer composition;

- study of rheological properties of the polymer composition prepared depending on the type of polymer base and plasticizer;

- Vodka of the components of the mixture, cuff, sealant, vulcanization, rheological properties. study of physical and mechanical properties of the polymer composition depending on the ratio;

- Research of technological mode of processing of plasticized polymer composition with sulfur vulcanization;

-development of proposals on perspective directions of application of the studied polymer composition; For the first time in the polymer composition based on SKN-40 rubber, diphenylpropane dicaprylate and diphenylolpropane oxypropylene esters were used as plasticizers. These organic compounds, which are esters of naphthenic acids, are characterized by high technological parameters. The plasticizers we use are very important for composition systems. The functional groups in the esters affect the rubber macromolecule, forming new vulcanization networks. The results confirmed the use of this plasticizer to produce rubber that meets the requirements and can work in aggressive environments.

Key words: *Butadiene-nitrile rubber, plasticizer, composition, technological parameters, aggressive environment, technical carbon, vulcanization, physical and mechanical properties.*

Language: *English*

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Introduction

Rubber products are widely used in the oil refining and petrochemical industries for the production of vodka, cuffs and sealants. Different plasticizers are used in the preparation of rubber compositions according to different recipes: fuel oil, rosin, rubrax, synthetic fatty acids, dioctylphthalate, dibutylphthalate, naphthenic acids and their simple and complex esters, etc. The main purpose of adding plasticizer to the rubber mixture is to modify the physical and mechanical properties of the rubber mixture.[1-10]

A number of plasticizers were used to plasticize SKN-40 rubber. However, these plasticizers do not fully ensure the even distribution and adaptation of the ingredients used in the rubber mixture based on SKN-40 rubber, the purpose of which is to synthesize a new plasticizer and eliminate its shortcomings.[11-14]

Ex is widely used in the refining and petrochemical industries for the production of rubber products, seals, cuffs and sealants. Different plasticizers are used in the preparation of rubber compositions according to different recipes: fuel oil, rosin, rubrax, synthetic fatty acids, dioctylphthalate, dibutylphthalate, naphthenic acids and their simple and complex esters, etc. The main purpose of adding plasticizer to the rubber mixture is to modify the physical and mechanical properties of the rubber mixture.[15-22].

A number of plasticizers were used to plasticize SKN-40 rubber. However, these plasticizers do not fully ensure the even distribution and adaptation of the ingredients used in the rubber mixture obtained on the basis of SKN-40 rubber, the purpose of which is to synthesize a new plasticizer and eliminate its shortcomings.

2. RESULT

We have adopted the recipe shown in Table 1 for obtaining a chemically resistant composition based on butadiene-nitrile rubber. Our main goal is to use the sample of the composition we bought to get vodka, cuffs and sealants. To prepare a composition based on butadiene-nitrile, the ingredients shown in Table .1 were mixed in a laboratory vial.

Table 1. The optimal recipe offered for the preparation of rubber mixture

№	Name of the ingredient	100 parts by weight of mass by part of rubber	Weight %	Weight
1	SKN-40	100.0	45.04	15
2	Altaks	2.0	0.90	0.30
3	Captaks	2.0	0.90	0.30
4	Neozon D	2.0	0.90	0.34
5	Zinc oxide	5.0	2.26	0.73
6	Dioktilftalat	2.0	0.90	0.4
7	Dibutilftalat	5.0	0.90	1.00
8	Sulfur	4.0	1.80	0.60
9	Technical carbon П-324	20.0	9.00	3.0
10	Oxypropylene ether of diphenipropane	1.0	0.45	0.15
11	Dicaprylate ether of diphenylolpropane	1.0	0.45	0.15

Optimal reseptə uyğun olaraq seçilmiş xammallar uyğun nisbətdə götürülmüşdür. Kompozisiya 25-30^{0}C temperaturda 10 dəqiqə ərzində hazırlanmışdır. Daha sonra əldə etdiyimiz rezin qarışığı Bakı Rezin-Texniki məmulatlar zavodunda xüsusi press-formalarda vulkanizasiya edilmişdir. Tədqiqatlarımızdan sonra belə məlum oldu ki, efir molekulunda olan funksional qruplar hesabına polimer makromalekulunda əlavə vulkanizasiya torları əmələ gəlir. Bu da öz növbəsində vulkanizatın aqressiv mühitlərə qarşı davamlılığının artmasına səbəb olur.

2.1 Research of vulcanization process

The vulcanization process was carried out at a temperature of 1550C for 20-25 minutes.

Physical and mechanical properties of rubber, vulcanizates and rubber compositions were studied in the laboratory.

The following parameters of vulcanizates based on rubber mixture were determined: relative residual deformation, breaking strength, relative elongation, tensile strength, adhesion strength, adhesion (metal contact strength), elasticity, hardness, flammability, etc.

The sequence of adding the ingredients between the shafts for the preparation of the composition on the laboratory roll is given in Table 2.

Table 2. Sequence of adding ingredients to the composition

№	Sequence of components	Qarışma vaxtı, dəq
1	SKN-40	0,1-1
2	Captaks	2,5
3	Zinc oxide	3
4	Mix	12
5	Sulfur	13
6	Cut	27

We studied the kinetics of plasticization of butadiene-nitrile rubber with naphthenic acids. As a result of the research, we found that the vulcanization process for the samples first decreases rapidly and then decreases. 25-35% of the 95/5 sample is vulcanized in the initial process. However, at the end of the process, the rate of vulcanization decreases, which is due to the heterogeneous nature of the system. When the ratios of rubber and naphthenic acid ether in the mixture are taken to be 90/10 and the temperature is 117-1210C, vulcanization is relatively slow. Further increase in temperature leads to the elimination of this deficiency.

The main properties of rubber are given in Table 3.

Table 3. Basic properties of vulcanizates of SKN-40 / Ether composition

	Part of the mixed mass						
Rubber Ether	100	97.5 2.5	95 5	92.5 7.5	90 10	87.5 12.5	85 15
	1	2	3	4	5	6	7
Properties of	vulcanizates						
Tensile strength limit, MPa MPa	20.7	21.5	22.9	22.1	20.2	19.2	17.6
100% tensile stress, MPa	3.6	3.6	3.5	3.54	3.2	2.8	2.0
300% tension in stretching, MPa	13.6	13.7	14.0	14.0	13.3	12.1	11.7
Relative stretch , %	380	450	475	470	470	450	410
Residual deformation , %	14.0	18.0	19.5	20.5	21.6	24.0	26.0
Tear resistance kN / M	32.9	39.5	45.9	51.0	49.5	49.0	45.5
Elasticity , %	40.0	40.0	40.5	39.7	40.1	38.0	35.0
Hardness conventional unit	70.0	70.0	69.0	69.0	69.5	70.0	71.0
120 minutes aging coefficients over time On fp On Ɛp	0.76 0.41	0.79 0.41	0.81 0.40	0.86 0.41	0.89 0.42	0.92 0.33	0.97 0.24
Resistance to fatigue in repeated traction Ɛdin = 200% V = 250 rpm.	1.150	1.99	2.450	2.500	2.580	1.750	1.150
Swelling for 180 hours at 250C,% Ignition time	114.0 x 292	115.0 x 300	115.0 x 320	117.0 x 390	120.0 x 97	125 x 60	139.0 x 35
Swelling after 168 days at 25 degrees,% Oil Gasoline acid (40% alkaline solution)	31.13 9.18 22.3 0.014	31.4 9.25 22.7 0.014	33.2 9.46 23.5 0.0199	31.7 9.50 23.8 0.013	32.3 9.38 22.9 0.0095	31.9 9.40 24.0 0.0105	32.5 9.35 23.7 0.095
Metal contact strength	1.45	1.48	1.52	1.65	1.99	1,67	1.58

2.3 Research of rheological properties of rubber composition

Diphenylolpropane oxypropylene and diphenylolpropane dicaprylate esters were modified with CKH-40 at 125-1350C for 4-5 minutes. Modifications were obtained and the physical and mechanical properties of the composition mixture were studied. It was determined that the obtained composition meets the requirements of the advanced standards and harsh operating conditions.

In the process of assessing the technological parameters of a polymeric material or filled compositions based on this or that polymer, it is necessary to know enough important information about their fluidity in the case of alloys. This is due to the fact that polymer-based materials are processed in the form of alloys, mainly under pressure casting, as well as by extrusion into many types of products. Without determining the rheological properties of the flow process of polymer alloys, it is impossible to apply them to industry by choosing the optimal mode of processing this or that material. In practice, the role of information to determine the fluidity of a polymeric material is played by the concept of the fluidity index of the alloy.

In order to determine the processing mode of the rubber mixture on the basis of ether / SKN-40, its rheological properties were studied. For this purpose, we found the flow rate of the mixture using the most modern devices and used it in processing. At the same time, we determined the volume flow rate (Q) depending on the amount of load, the voltage dependence of the flow rate of the mixture, the effective viscosity depending on the displacement voltage. In the laboratory, the device IIRT-5 (capillary viscometer) is used to determine the above parameters. In this device, the Ether / SKN-40 composition was used to determine how long the viscometer indicator needle flowed at a distance of 20 mm. The results obtained are given in Table .4. We calculate other indicators based on the flow times shown in the table.

Table 4. Indicators of capillary flow time

	Alloy flow			
№	13,08	19,14	24,54	32,06
1	68"04"	49"09"	31"75"	17"63"
2	38"73"	18"24"	11"808"	8"36"
3	29"18"	15"25"	10"90"	6"96"
4	17"32"	13"93"	8"30"	6"08"
5	9"22"	7"05"	4"45"	3"08"

3.CONSLUSION

The kinetics of the vulcanization process of a rubber mixture based on butadiene-nitrile rubber was found. The vulcanization mode is defined as follows: T = 1550C, P = 5MPa, t = 20 minutes.

The physical and mechanical properties of vulcanizate were studied and it was shown that the parameters of the obtained product meet the requirements of the standard.

For the first time we used diphenylolpropane dicaprylate and oxypropylene esters as plasticizers, and the results allow us to use these plasticizers in the future in the production of oil and gasoline resistant rubber.

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