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I.H. Movlaev
Azerbaijan State Oil and Industry University
Docent of the department
"High Molecular Compounds and Organic Substances"
i.movlaev@mail.ru

G.H. Ibrahimkhalilova
Azerbaijan State Oil and Industry University
Master of Science of the department
"High Molecular Compounds and Organic Substances"

COMPOSITIONS BASED ON TRIPLE ETHYLENE-PROPYLENE COPOLYMER AND MODIFIED EPOXY OLIGOMER MIXTURES

Abstract: *The properties of compositions based on mixtures with modified epoxy oligomers (ED-20/SKN-26-1- 3,7/ 0,3- 3,4/0,6) and epoxy oligomer of triple ethylene-propylene copolymer - breaking strength, tear resistance, fatigue resistance to repeated deformation, metal bond strength and etc. improved.*

Key words: *triple ethylene-propylene copolymer, modified epoxy oligomer (MED-20), composition, modification, breaking strength, fatigue resistance to repeated deformation, tear resistance, wear coefficients.*

Language: *English*

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Introduction

As we know, triple ethylene-propylene copolymer (SKEPT) is a product obtained from the copolymerization of ethylene-propylene-cyclopentadiene monomers in solution under the action of a complex catalyst formed as a result of a combination of alkyl derivatives of aluminum and vanadium halide derivatives [1, p. 16; 2. p. 17; 3.p. 9]. The saturation of its main chain makes the vulcanizers obtained from it resistant to high temperatures, ozone, as well as to the effects of aggressive environments, while maintaining its elastic and strength properties Along with the cheap sources of raw materials for triple ethylene-propylene copolymers [4. p. 53; 5. p. 57; 6. p. 3] .

Rubbers based on triple ethylene-propylene copolymer are highly resistant to swelling in water and have excellent dielectric properties.

Data from rubber compounds based on SKEPT have the ability to be operated at high temperatures (up to 150^0C) and are widely used. In addition to the above-mentioned positive properties of rubber based on the triple ethylene-propylene copolymer, one of its disadvantages is its low (weak) bond strength to metals and fabrics [7. p. 63; 8. p. 75; 9. p. 1258;]

The low vulcanization rate of the triple ethylene-propylene copolymer and its limited compatibility with unsaturated rubbers limit its widespread use in the rubber industry [10. p. 81]. The main goal is to develop rubber compositions based on the modification of the triple ethylene-propylene copolymer with oligomer with functional group (epoxy oligomer) in different proportions in order to improve the above-mentioned disadvantage, ie its compatibility with other rubbers.

Experimental part

We pre-modify the epoxy oligomer with liquid butadiene nitrile (SKN-26-1) rubber in different proportions at 60-70^0C for 4-6 minutes, then compositions based on mixtures of triple ethylene-propylene copolymer with modified epoxy oligomer

(MED-20) in different proportions are prepared. (Table 1)

Table 1. Composition based on SKEPT-60 and MED-20 mixtures

№	The code of the mixture / Components	1	2	3	4	5	6
1	SKEPT-60	100	96	96	96	96	96
2	ED-20	-	3.7	3.4	3.1	2.8	2.5
3	SKN-26-1	-	0.3	0.6	0.9	1.2	1.5
4	Sulfur	2.0	2.0	2.0	2.0	2.0	2.0
5	Tiuram	1.5	1.5	1.5	1.5	1.5	1.5
6	Captaks	0.5	0.5	0.5	0.5	0.5	0.5
7	ZnO	5.0	5.0	5.0	5.0	5.0	5.0
8	Stearic acid	1.0	1.0	1.0	1.0	1.0	1.0
9	Technical carbon P-234	50	50	50	50	50	50
	Total	160	160	160	160	160	160

Compositions based on the SKEPT-60/MED-20 mixture are prepared in 25-30 minutes according to the recipe shown in Table 1. The prepared compositions are removed from the shafts of the propeller in the form of a sheet 2.5-3 mm thick and placed on a rack and stored at room temperature for 6-8 hours in accordance with the standard. Samples from the composition mixtures are then cut and placed in molds (hearts) and vulcanized in a hydraulic vulcanization press at a temperature of 155 ± 2^{0}C for 30 minutes.

The obtained vulcanizers are studied for physical, mechanical and chemical properties after storage at room temperature for 4-6 hours. (Table 2)

Table 2. Physical and mechanical properties of compositions based on SKEPT-60/MED-20.

№	The code of the mixture / Indicators	1	2	3	4	5	6
1	Fracture strength limit, MPa	20.4	21.4	21.2	20.8	19.8	19.3
2	100% elongation strength limit, MPa	3.1	3.4	3.3	3.2	3.0	2.80
3	300% elongation strength limit, MPa	13.2	14.4	14.3	14.1	13.0	12.9
4	Relative stretch, %	382	425	430	440	443	449
5	Residual deformation, %	14.5	14.5	14.0	13.9	13.6	13.2
6	Tear resistance, kN/m	32.1	37.0	38.1	38.7	38.1	37.5
7	Elasticity on the back jump, %	40.0	43.6	42.4	43.8	43.9	44.3
8	Hardness on TM-2, ş.v	70.2	69.4	69.0	68.0	67.8	67.1
9	Resistance to fatigue in repeated deformation (V = 250 rpm, Ldin = 200%, t = 23^{0}C) min.p.	1.108	1.952	2.225	2.389	2.198	2.005

10	Wear coefficients after storage at 120^0C for 25 hours On $Ɛ_p$ On $Ɛ_L$	 0.80 0.43	 0.84 0.47	 0.85 0.48	 0.83 0.48	 0.80 0.49	 0.79 0.46
11	Contact strength with metal (pol.3), MPa	1.40	2.30	2.38	2.48	2.33	2.0

Results and discussion

The study of the properties of compositions based on SKEPT-60/MED-20(ED-20/SKN-26-1-3,7/0,3- 3,4/0,6) showed that the properties of the compositions based on SKEPT-60 are significantly improved compared to the unmodified composition: breaking strength limit 21.1 MPa against 20.4 MPa, tear resistance 32.1 kN/m against 36.8 kN/m, resistance to repeated fatigue 1,108 cycles against 2,145 cycles, resistance to metal contact 1.40 MPa against 2.95 MPA.

The improvement of the properties of the composition on the basis of SKEPT-60/MED-20 is based on the structural change of the chemical structure of the triple ethylene-propylene copolymer of MED-20 during vulcanization.

Conclusion

Improvement of adhesive properties and fatigue resistance of multiple properties of compositions based on SKEPT-60 and MED-20 mixtures in relation to the composition based on SKEPT-60 can be widely used in the production of compositions based on rubberized fabrics, conveyor belts, forming rubber products and mixtures with functional group rubbers.

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