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Obtaining New Components And Testing Physical-Mechanical Properties of Rubber-Metal Based Damper Device Systems

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Abstract*:* This article describes the development of samples of rubber-metal damper pads with a special new composition. Based on the conducted research, a rubber-metal based damper model with a new composition was developed to increase the seismic resistance of buildings and structures. During the tests, it was possible to develop a new composition with a damping "cushion" of the 1st, 2nd and 3rd rubber material specifically for the proposed damper equipment. When obtaining rubber from these compositions, rubber is mainly prepared using special vulcanizing equipment in the production or laboratory. It was solved by obtaining a layer of fire-resistant composite containing it. The material can be obtained with a fire-resistant layer, in addition, it has been determined that it is equal to 4% by weight of vulcanizer.

Key words: Rubber, damper, metal, global, active, seismic systems, waltz, extruder.

Introduction

The issue of improving the methods of preventing natural and man-made damage to buildings and structures is also one of the urgent issues. Modern trends in the field of planning and structural solution of seismic resistant objects of these structures envisage the reduction of possible damage caused by earthquakes. Here there are industrial buildings, structures, technological equipment, dangerous manifestations of exogenous processes, the presence of soils in class II (almost 60% of the territory of the republic), man-made accidents, etc.

In solving such global problems, we should use previously developed systems and devices to reduce risk factors in various external influences. In our opinion, one of such practical solutions is to expand the possibility of using elastic-plastic damper systems, active seismic systems and passive seismic systems in the industrial and civil construction of the Republic of Uzbekistan.

To increase the seismic tolerance of buildings and structures, we had to start our research with the creation of new types of active and passive seismic systems. Of course, today in world research, large-

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scale researches have been conducted on the creation of new types of active seismic systems to increase the resistance of high-rise buildings to natural and man-made damage. Based on it, on the basis of our research on increasing the seismic resistance of buildings and structures, samples of damper pads with a special new composition of rubber-metal base were developed. During the tests, the rubber-metal base rubber-metal base is the first composition selected for the main rubber material of the damper equipment.

2.1-table

	Recommended rubber composition	% 100
1	Intercalated graphite	22,0-5,0 %
2	Kaolin	0,5-2,5 %
3	Aerosil	2,0-5,0 %
4	Ammonium polyphosphate	10,0-15,0 %
5	Chloroparaffin	5,0-10,0 %
6	Aluminum hydroxide mass	10-5 %
7	Sulfur (vulcanizing agent)	2-3
8	Strearic acid	0,2-0,5
9	Metal oxides (mixture of ZnO, MgO in a ratio of 5:3) An additive that activates the vulcanization process	3-4
10	Chloroprene rubber material plus antimony trioxide mass	45-50 %

When obtaining rubber from these compounds, rubber is mainly prepared using special vulcanizing equipment in the production or laboratory. For this purpose, a roller, calender, extruder and mixer are used to mix chloroprene rubber with additives, and the vulcanization process lasts 30-40 minutes at a temperature of 140-160 ^{o}C. It is solved by obtaining a layer of fire-resistant composite containing it. The material can be obtained with a fire-resistant layer, in addition, it has been determined that it is equal to 4% by weight of vulcanizer. Also, the material can be obtained with a layer of flame retardant composition. During the tests, the second composition selected for the main rubber material of the rubber-metal-based damper equipment;

	Recommended rubber composition	(%)100
1	Butadiene-nitrile rubber SKN 4045	35.0-40.0
2	Isoprene rubber SKI-3	10,0-15,0
3	Methyl styrene rubber SKMS - 30 ARK	10.0
4	Sis-butadiene rubber SKD 10.0 sulfur	1,4-1,6
5	Dibenzthiazolyl disulfide	1,9-2,1
6	Tetramethylthiuramdisulfide	0,5-0,8
7	Zinc oxide	2,0-3,0
8	Antioxidant	1.0
9	Stearic acid	0,5-1,5
10	Acetonanil N	1,5-2,5
11	Ammonium polyphosphate	10-12.5
12	Technical carbon N 220	2,5 -3,0
13	Talc 5.0-7.0 dibutyl sebacinate substance	6,0-7,0

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During the tests, a new composition with a damping "cushion" was developed based on the third composition selected for the main rubber material of the rubber-metal damper device.

2.3-table

№	Recommended rubber composition	(%) 100
1	The technical component is ethylene-propylene rubber	48,0
2	Chlorosulfated polyethylene	2,4
3	Zinc bleaching agent	3,8
4	Stearic acid	0,96
5	Plasticizer (naphthenic oil)	0,48
6	Magnesium oxide	1,4
7	Antimony oxide	1,44
8	A terpene blend	2,4
9	Pottery clay	3,36
10	Antioxidant (phenyldiamine))	0,24
11	Paraffin oil	4,3
12	Institution	26,4
13	Chloroparaffin 70%	1,44
14	Sulfur	0,14
15	Vulcanizer	0,1
16	The technical component is ethylene-propylene rubber	2.4

The tensile strength TS, MPa, of the proposed 1, 2 and 3 rubber composition materials was determined according to the following formula:

$$\mathrm{TS} = \frac{F_m}{Wt}$$

The level of hardness at break TSb, MPa, was determined according to the following formula:

$$\mathrm{TS}_b = \frac{F_b}{Wt}$$

Elongation at relative break was calculated by the formula Eb, %

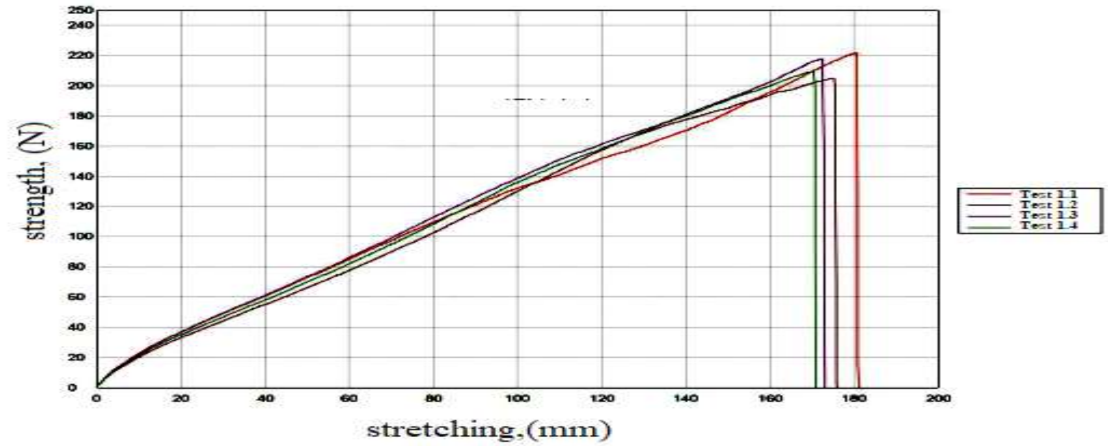
$$E_b = \frac{100(L_s - L_o)}{L_o}$$

The tensile stress of the proposed 1, 2 and 3 rubber materials was calculated according to the formula Se MPa.

$$S_e = \frac{F_e}{Wt}$$

The tensile stress Es % of the proposed 1, 2 and 3 rubber materials was calculated according to the following formula.

$$E_s = \frac{100(L_s - L_o)}{L_o}$$



Picture-1. The results of the effect of the proposed rubber material 1 on creep are presented

The tensile strength Fe N of the proposed 1 and 2 rubber materials was calculated according to the following formula.

$$F_e = S_e W t$$

Conditional tensile stress Sy, MPa was calculated by the formula:

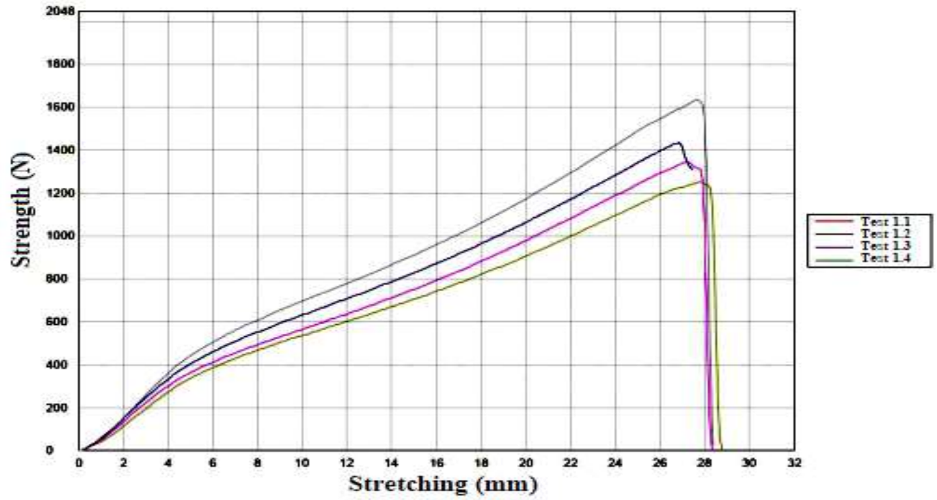
$$S_y = \frac{F_y}{Wt}$$

The relative elongation Ey, % of the composition of the proposed 1, 2 and 3 rubber materials is calculated according to the following formula;

$$E_y = \frac{100(L_y - L_O)}{L_O}$$

Proposed 1, 2 and 3 use the following symbols to determine the effect of the composition of rubber materials on rupture and given forces: Fb – registered force at rupture, N; Fm is the maximum registered force, N; Fy is the force registered in the stream, N; Lo – initial test length, mm; Lb – test length at break, mm; Ls - test length at given voltage, mm: Ly - test length at current, mm; .t- thickness of the narrow part of the sample W- width (determined according to 12.1), mm. Tensile hardness TS, MPa, was determined by the following formula:

$$\text{TS} = \frac{F_m}{2Wt}$$



Picture-2. The results of the material effect of the proposed rubber materials 2 and 3 on the creep are presented

Tensile strength TS, MPa, is determined by the following formula:

$$TS_b = \frac{F_b}{2Wt}$$

Elongation at relative break Eb, %, is calculated by the formula

$$E_b = \frac{100(\pi\partial + 2L_b - C_i}{C_i}$$

Conditional stress at a given elongation Se, Mpa, is calculated according to the formula

$$S_e = \frac{F_e}{2Wt}$$

The given elongation Le is calculated according to the formula according to the distance between the centers of the wheels in millimeters corresponding to mm:

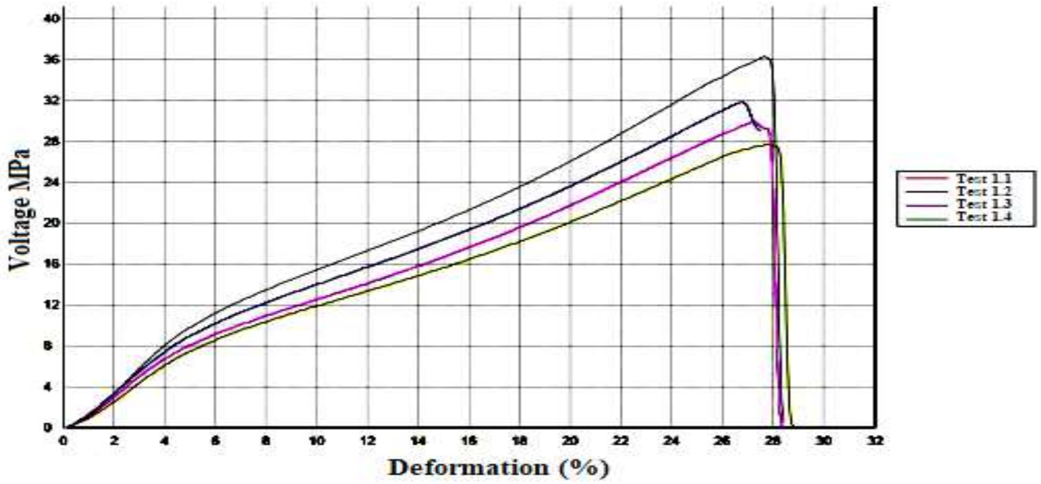
$$L_e = \frac{C_m E_S}{200} + \frac{C_i - \pi\partial}{2}$$

The relative elongation Es % at a given stress is calculated by the formula:

$$E_s = \frac{100(\pi\partial + 2L_s - C_i}{C_m}$$

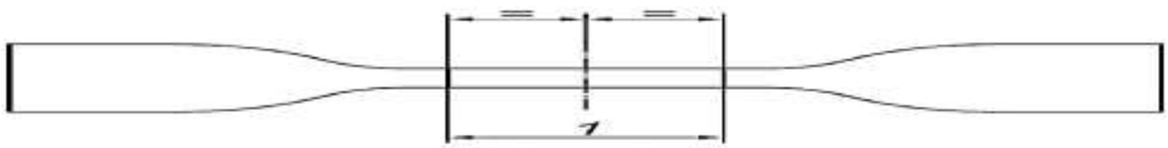
The relative elongation at elongation Ey, %, is calculated according to the formula

$$E_y = \frac{100(\pi\partial + 2L_y - C_i}{C_m})$$



Picture-3. The results of the study of the effect of the proposed 2 and 3 rubber materials on the deformation of the refractory rubber material are presented.

When testing small-sized samples, values of stiffness at break and relative elongation at break can be obtained more than for large samples. Seven types of samples are tested - 1,2,3,4 and 1A spade types and ring types A (medium) and B (small). It is noted that the test results of a specific material may vary depending on the type of sample. It is proposed to compare the results of tests obtained for different materials with one type of sample. If the preparation of the samples requires grinding or adjusting the thickness, the results may be incorrect.



Picture-4. The experimental form of the rubber sample is presented.
1 - the test length of the sample (table-1)

Sample type	1	2	3	4
Test length, mm	25,0±0,5	20,0±0,5	10,0±0,5	10,0±0,5

The shape of the proposed rubber material according to the basic standard should have the shape shown in Figure 5. It was taken into account that the thickness of the narrow part of samples of types 1, 2, 3 and 1A is the standard thickness of (2.0 ± 0.2) mm, and the standard thickness of the sample of type 4 is (1.0 ± 0.1) mm. Based on the conducted research, a sample of a rubber-metal based damper with a new composition was developed to increase the seismic resistance of buildings and structures. During the tests, a new composition with a damping "cushion" of a new composition of rubber material 1, 2 and 3 was developed specifically for the proposed damper equipment.

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