ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 5, Issue 10 , October 2018

The Filled Elastomeric Composite Materials for Mechanical Engineering

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ABSTRACT: In work are considered influence of fillers on physic-mechanical properties of elastomeric composite materials. Expediency introduction polymeric additive in rubber mixes on the basis of synthetic rubbers which being evenly distributed in volume of the turning-out composition is shown, form accurately expressed limit of the section with the polymeric environment. At the same time technological properties of composite elastomeric material improve and also the volume of material increases and its cost falls.

KEYWORDS: Composition, elastomer, modification, filler, mix, curing, mechanical engineering.

I. INTRODUCTION.

Elastomeric composite material represents the difficult multicomponent system consisting of a polymeric basis and various chemical ingredients. Elastomers which can be processed into rubber usually are called rubbers. The majority of rubbers turns into rubber at emergence between their macromolecules of strong cross communications and formation of a spatial grid.

Now about a half of the output of rubber industry make car tires, more than a third – rubber technical products which nomenclature is especially diverse.

Progress in mechanical engineering is inseparably linked with development and wide use of the polymeric composite materials (CM). The wide range of fields of possible application of composites causes need of improvement traditional and developments of new composites, in particular materials for mechanical engineering with a complex of the required physic-mechanical properties.

For receiving rubber with the set complex of properties prepare rubber mix – composition of rubbers and ingredients of a certain structure what requires the exact dispensing of the applied materials which is carried out generally by means of a weighing.

One of the main ingredients are fillers.

Mixture of rubber at a lateks stage with filler and the subsequent joint coagulation allow to improve significantly distribution of filler in rubber big power expenses that leads to decrease in an expense of the electric power at preparation of rubber mixes [1].

Introduction of fillers promotes improvement of physic-mechanical and technological properties of elastomeric materials and also increase in volume of material, i.e. decrease in its cost.

II. SIGNIFICANCE OF THE SYSTEM

In article is considered experimental results of a research of influence of fillers on physic-mechanical properties of elastomeric materials. The research of the literary review is presented in the section III, the methodology is explained in the section IV, the section V covers results of an experiment of a research, and the section VI discusses future research and the conclusion.

III. LITERATURE SURVEY

In development of science about the composite disperse filled materials it is possible to allocate two main stages. The first is connected with a research of the filled rubbers. On the basis of results of pilot studies it has been

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 5, Issue 10 , October 2018

established that mechanical characteristics (durability and relative lengthening at a gap) elastic composites decide on rigid inactive filler by properties and content of matrix polymer and monotonously decrease with reduction of its concentration [2]. The second stage is connected with studying of composites on the basis of plastic polymers with rigid particles. In these materials often there is a transition from plastic deformation to a fragile gap (embrittlement) at small extents of filling [3, 4].

Now progress in mechanical engineering is inseparably linked with development and widespread introduction of the constructional polymeric composite materials (PCM) in production.

PKM have a complex of the physic-mechanical properties favourably different from traditional constructional materials (metals, alloys, concrete, a tree) and in total open ample opportunities for improvement of the existing materials and products of mechanical engineering.

Polymeric composites are widely used for production of the constructional materials and products having high deformation and strength properties.

Idea of polymeric composites, as about multicomponent and multiphase heterogeneous systems is conventional [5 - 9]. At the same time in PKM not additive properties (for example, at the same time high elastic and damping rates), not inherent in the making components (fillers, the matrix binding, plasticizing and modifying additives) of polymeric composites separately can be formed at the same time. This feature is effectively used during creation of the constructional composites with high elastic properties applied in mechanical engineering.

Elastomers - (rubbers, rubbers) polymers which in a wide interval of temperatures corresponding to service conditions, have highly elastic properties that is under the influence of small external forces they are exposed to considerable irreversible or reversible deformations.

Strengthening of rubbers is that at introduction of fine fillers to rubber mixes there is an essential increase in durability and improvement of some physic-mechanical properties of curing in a highly elastic state.

IV. METHODOLOGY

Methodological basis at the solution of problems of materials research and technological character is the concept of system approach at which structure, the structure and properties of the disperse filled composite materials are presented in the form of the interconnected system.

As an object of researches we have used synthetic isoprene rubber (SKI-3) (GOST 14925-79). SKI-3 rubber contains gel of fraction to 30%. And also butadiene - methylstyrene SKMS-30 ARKM-15 rubber (GOST 11138-78) which contains about 30 masses.h connected α – methylstyrene.

As filler used technical carbon and secondary raw materials.

Batches of rubber mixes with introduction of fillers – PM-75 soot and polymeric additive have been in vitro made (secondary raw materials).

Physic-mechanical properties of curing defined according to GOST 270-75 - elastic strength properties at stretching, relative lengthening (Eotn), residual deformation after a gap (Eост), resistance I will tear apart GOST 262-73.

V. EXPERIMENTAL RESULTS

Compounding of rubber mixes with secondary raw materials are presented in table 1.

The mode of production of rubber mixes on laboratory rollers is presented in table 2.

The high effect gives joint introduction to rubber at a stage of latex of oil and filler.

At introduction to rubbers of fillers are characterized by the high mechanical durability and wear resistance.

Interaction of elastomer decides on filler by the nature of filler or character of his surface. The more interaction of elastomer with filler, the is, as a rule, higher effect of strengthening.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
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Table 1
Compounding of rubber mix on the basis of SKMS-30 ARKM rubbers and SKI-3

Ingredients Ingredients	Standard mix	Mix with polymeric additives
Hingeplate, kg		
SKI-3 rubber	0,245	0,245
SKMS-30 ARKM rubber	0,245	0,245
Sulfur	0,009	0,009
Altax	0,002	0,002
Sulfenamid of "TS"	0,004	0,004
Whitewash zinc	0,009	0,009
PM-75 soot	0,319	-
Paraffin	0,003	0,003
Neozones "D"	0,005	0,005
Oilvaseline	0,159	0,159
Secondary raw materials	-	0,319
-	1,000	1,000

The mode of production of rubber mixes on laboratory rollers is presented in table 2.
Table 2
Mode of production of rubber mixes

Order of introduction of ingredients	Time, min.
Rollings of ARKM-15 SKI-3 and SKMS-30 rubbers	3
Introduction of small hinge plates	2
Introduction of oil vaseline, soot	5
Total	10

Physic-mechanical properties developed compositions investigated in accordance with GOST 126-79.

Plasticity of the rubber mixes made according to recipes shown in table 1 and physic-mechanical indicators are presented in table 3.

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

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Physic-mechanical indicators of rubber mixes conform to requirements of GOST 126-79.

In the course of mixture there is an adsorption of elastomer on the surface of filler, and the adsorbed elastomer can't be completely removed from a surface of particles with effect of solvents. It demonstrates to a polymer hemosorbtion on filler particles. Formation of strong communications between macromolecules of rubber and particles of filler is promoted by the mechanodestruction processes proceeding in the course of mixture and which are followed by emergence of free radicals which can interact with filler.

Table 3

Physic mechanical indicators of the developed rubber mixes

Number of the recipe	1	2	GOST 126-79
Plasticity	0,41	0,43	
Relative lengthening, %	490	502	no< 300
Residual lengthening, %	26	22	no> 40
Strength, kgf/sm^2	138,0	144,0	no< 80

In the rubber mixed with fillers, a considerable part of molecules is adsorbed on a surface of particles of filler, and force of communication of macromolecules with a particle of filler is more, than force of interaction of macromolecules among themselves, and less, than from durability. Thanking such intermediate size of forces of communication of an overstrain, arising in a grid at deformation, there can't be more adsorptive forces. As soon as the overstrain on any site of elastomer becomes equal to adsorption force, the desorption of intense macromolecules begins owing to what at further deformation tension falling on the loaded macromolecule doesn't increase. Poorly intense and not intense chains are occluded by particles of filler and assume a share of tension [10].

VI. CONCLUSION AND FUTUREWORK

On the basis of the carried-out work we come to the following conclusion. At introduction polymeric additive (secondary raw materials) in rubber mixes on the basis of the ARKP synthetic SKI-3 and SKMS-30 rubbers physic-mechanical indicators (conditional durability improve at a gap) for 10-15% (in relation to the conditional durability of production rubber mixes).

Besides, plastoelastic properties of rubber mixes improve.

Thus, introduction polymeric additive in rubber mixes on the basis of synthetic rubbers expediently. At deformation of the filled rubber the general tension is distributed between elements of a spatial grid of elastomer much more evenly that leads to increase in tension during the lengthening and durability at stretching. The gap comes when owing to a desorption the possibility of alignment of tension is exhausted.

REFERENCES

[1]. Koshelev F.F., Kornev A.E., Bukanov A.M. General technology of rubber. – Prod. the 4th. – M.: Chemistry, 1978. – 528 pages.

[2]. Nielsen L.E. Mechanical properties of polymers and polymeric compositions. M.: Chemistry, 1978.

[3]. Tochin V. A., Shchupak E.N., Tumanov V.V. Concentration dependence of deformation characteristics of compositions of polyethylene of high density with disperse fillers.//Mechanics composite, materials. 1984. No. 4. Page 635-639.

[4]. Bazhenov S.L., Li J.X., Hiltner A., Baer E. Ductility of filled polymers. // J. Appl.Polym. Sci. 1994.V.52. №2. P 243-254.

[5]. Bobryshev A.N., Zharin D. E., Gumerov A.F. Thermoreactive polymeric composites in mechanical engineering / under the editorship of чл. PAACH correspondent, прф. A.N. Bobrysheva. StaryOskol: TNT, 2008. 152 pages.

[6]. Shibakov V.G., SokolovaYu.A., Bikulov P.A., Zharin D. E. Production of composite materials and chugun of a special purpose for mechanical engineering: manual. M.: Palaeotype, 2010. 240 pages.

[7]. Synergetrics of composite materials / A.N. Bobryshev, V.N. Kozomazov, L.O. Babin, V.I. Solomatov; under the editorship of V.I. Solomatov. Lipetsk: NPO ORIUS, 1994. 153 pages.

[8]. Bobryshev A.N., Kozomazov V.N., Avdeev R.N., Solomatov V.I. Synergetrics of the disperse filled composites. M.: TsKT, 1999. 252 pages.

[9]. Thevibrodamping polymeric composites / A.N. Bobryshev, D.E. Zharin, A.F. Gumerov; under A.N. Bobryshev's edition. ChelnyEmb.: Prod. Institute of management, 2001.183 pages.

[10]. Kurin, C.B. Durability of the disperse filled polymeric composites/L. N. Bobryshev, R.I. Avdeev, D.E. Zharin, C.B. Kurin, V.V. Tuchkov//Plastics, - 2003. - No. 1. - Page 15-17.