DEVELOPMENT AND RESEARCH OF COMPOSITE MATERIALS FOR CONSTRUCTION PURPOSES

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Abstract.

The technological basis for obtaining electrical insulating composite materials with high dielectric properties based on modified epoxy resin and basalt roving is considered. The optimum conditions for obtaining composite materials are revealed. The main parameters of electrical properties of composite insulating materials have been studied and the determining role of thermophysical properties of the filler - basalt roving - in the formation of composite materials with improved technical and operational characteristics has been established.

Keywords.

Modified epoxy resin, composition, material, electrophysical properties, basalt plastics, technology, roving, dielectric properties, filler, thermosetting resins.

The most important achievement of the last two decades in the field of composite materials science has been the creation of basalt plastics as a new class of composite materials. Basalt plastics due to unique properties: high thermo-, chemo- and fire-resistance find wide application in electrical engineering, radio-, instrumentation engineering, machine building, shipbuilding and other industries [1-4]. The corrosion resistance of parts made of basalt plastics predetermine the prospects of their use as structural materials for polyfunctional purposes.

We were the first to show the possibility of using basalt fibre instead of carcinogenic asbestos in the manufacture of friction materials for various types of vehicles operating under heavy-duty conditions [5]. To date, serial production of friction materials has been mastered at APATER-ORION LLC.

The development of technological basis for creation of basalt plastics for electrical insulation purposes is of undoubted interest. In this connection, we have developed an effective composition and technology for producing electrical insulation composite materials based on superfine basalt fibre and roving and thermosetting binders. Thus, for example, a metal composite insulator of 6TP. 280.045., which is used as a fixing of busbars of electric installation in a body of electric locomotive, and also a bushing of an insulator under rails for railway transport. The main electrical insulation characteristics of the developed composite materials are given in the table.

Table 1 **Electrical properties of the metal composite insulator type 6TP 280.045.**

№ n/a	**Name of product characteristics to be determined**	**Main technical characteristics**	**Name of indicators**	**Test results**	
				Research-my sample	**in accordance with GOST**
1.	Determination of the dielectric constant and the tangent of the dielectric loss angle	Test range for alternating current 10μA-1A, alternating voltage (0.5-10) kV.50Hz.	Tangents of the dielectric loss angle	**0,06**	**GOST 22372**
			Dielectric constant	**4.536**	**GOST**

					22372
2.	Measurement of voltage and leakage current	Measuring range of alternating current (0.1-2.0) mA, alternating voltage (0.5-50) kV.50Hz	Field strength at breakdown, kV\mm.	**9.0**	**GOST 24613.2-81**
3.	Electrical strength at alternating and direct current	Test range for DC and AC testing (0.1-2 mA, DC and AC voltage) (0.5-20) kV.50Hz	Electric leakage current after exposure to 12kV for 1 minute, mA	**124**	**GOST 1516.1-76**
4.	Specific volumetric electrical resistance	DC voltage (0.1-1000) V Resistance R change ($^{103\div1016}$) Ω. I change (0÷100)	Volumetric specific resistance Ω -m	**2,4121*10^{16}**	**GOST 50499-93**
			Specific resistance, Ω.	**2,6663*10^{17}**	
5.	Measurement for withstand voltage of industrial frequency	Variable voltage (0.5-500.0) kV.50Hz.	Variable voltage, kV,50Hz.	**21,1**	**GOST 30284-2017**
6.	Bend control tester and torsion test "QHWN-1500L", serial number: 20130304	Mechanical normalised and breaking bending load	Bending measurement range 25 kN, torsion 8kNm, error ±1%	Bending, kN	**2,80**
7.	Horizontal ripping machine with hydraulic servomotor and computer controller: Model QHWLW-300\A, Serial No.: 2013030	Tensile test force measurement (compression)	Breaking force up to 300kN, with an accuracy of ±1.0%	Tension (compression), kN	**73,81**

The tables show that the developed insulator type 6TP.280.045. made from a new composite material, is characterised by high electrical resistance and low values of dielectric constant, dielectric losses and sufficient electrical strength, in the dry state up to 21 kV.

In our opinion, the use of basalt plastics as moisture-resistant and fire-resistant composite materials in mechanical engineering to manufacture parts operating in conditions of high humidity and temperature is of particular interest. In this connection composite laminates for decking of bus bodies of "ISUZI" type instead of imported bamboo and birch plywood has been developed. It is shown, that composite plastics on basalt-plastic basis are characterized by high strength of 34-36 MPa, moisture resistance and fire-resistance. Fireproof properties of composite materials based on basalt fiber opens up wide prospects of basalt plastics application as structural materials of wide application in mechanical engineering.

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