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TYPES AND PROPERTIES OF ADDITIVES FOR THE RESEARCH OF PLASTER COMPOSITE MATERIALS USED IN MONUMENTS

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A R T I C L E I N F O.

Keywords: Granulated, gypsum, fibers, solution flowing, FREM NANOGYPSUM, gypsum concrete samples.

Annotation

In this article, the additives and their properties, which are necessary for the research of composite materials that can be used in architectural monuments, are thoroughly analyzed.

Enter: Mineral wool is a vitreous fiber material obtained on the basis of easily soluble rocks (limestone, marls, dolomites, etc.), [1] metallurgical and fuel slags (clay and silicate brick fragments). The diameter of the fiber is 5-15 μm, the length is 2-40 mm. [2]. The production of mineral cotton consists of two main processes: creating a solution of raw materials in vats (smelting furnaces); converting the solution into fibers. [3]. In Vagranka, raw materials are liquefied with solid fuel (coke) at a temperature of 1300-14000C. The solution is continuously released from a special hole at the bottom of the tank. [4].

There are several methods of turning the raw material solution into mineral fibers, but mainly two methods are more commonly used: blowing and centrifugation. [5]. In the blowing method, the solution flowing out of the special hole (let) of the vagranka is turned into fiber with the help of water vapor or a stream of compressed air and is scattered. [6]. In the centrifugal method, the flow of the solution falls through the hole of the wafer onto the centrifuge disc and is spun into fibers and dispersed. [7]. The resulting mineral fiber is collected on a continuously moving mesh in the chamber.

Main part: Depending on the average density, mineral cotton is divided into 75, 100, 125 and 150 brands. Mineral cotton is fireproof, low hygroscopicity and resistant to water environment, heat transfer coefficient is small (λ=0,04-0,55 Vt/(m·^{0}S)), resistant to biological environments. [8].

Mineral cotton is granulated (rounded) for ease of transportation, storage, and use. It is transported wrapped in special papers; it is used as a heat insulation material in wall cavities, inter-floor plate cavities, hot water mains and other constructions. [9].

Mineral cotton is a semi-finished product for the production of felt, fabrics, (beds) semi-bikr and bikr sheets, products with a corrugated structure, shells, segments and other products. [10].

Melting bottles are turned into cotton by means of special technologies. [11]. Glass slag (quartz sand, calcined soda and sodium sulfate) and broken glass are used as raw materials. The process of obtaining glass cotton is as follows: melting the glass mass in bath furnaces at a temperature of 1300-14000C; preparation of glass fibers; molding of articles. [12].

Glass fibers are made from liquefied mass by stretching and blowing methods. In the rod method, glass fibers are stretched on rotating drums by heating glass rods until they melt. [13]. In the filler method, the liquefied glass mass is passed through the filler holes (not very large) and stretched on drums. In the blowing method, the fiberglass liquefied glass mass is dispersed under the influence of compressed air or steam. [14].

According to the field of use, textile and thermal insulation (staple) glass fibers are produced. The average diameter of textile fibers is 3-7 μm, and heat insulation fiber is 10-30 μm. [15].

Glass fibers differ from mineral fibers by their length, resistance to chemical environments, and high strength. [16]. The average density of glass wool is 75-125 kg/m3, thermal conductivity is 0.04-0.052 W/(m.0S), heat resistance is 4500S. [17]. Sheets, strips, fittings, textile and non-woven products and other materials are made from fiberglass. [18]. Mats and strips are fixed by sewing glass fibers with glass thread. The average density of these products is up to 175 kg/m3, thermal conductivity is at most 0.04-0.05 W/(m.0S). [19]. Mats are produced with a length of 1000-3000 mm, a width of 200-700 mm and a thickness of 10-50 mm. [20].

Plates are produced in 1000 mm length, 500-1500 mm width and 30-80 mm thickness. Products based on glass fiber are used in thermal insulation of construction structures, technological equipment, pipelines used at a temperature of 2000C, walls of industrial cold rooms, etc. [21].

Research results:

Gypsum plasterboard sheets are considered finishing material made of p-modified gypsum, reinforced with mineral fibers and high-quality multi-layer pressed on both sides with a thickness of not more than 0.6 mm, glued with a cardboard adhesive (dextrin, casein glue, liquid bottle). [22]. In addition to materials, substances that reduce their mass are also used in the production of GKQ; gypsum-dihydrate - to adjust the time of setting, sulfated yeast and foaming compounds (casein, rosin, caustic soda). [23].

FREM NANOGYPSUM is an additive for plaster mixtures. It is a mechano-chemically activated mixture of additional inorganic salts and various polycarboxylates, supplemented with various hydrophobic radicalizing and crystallization regulating substances, changing the composition of the mixture. [24].

Additions in Belarus are prepared in accordance with TU 691423315.018 - 2016 from 05.26.2016. [25].

FREM NANOGYPS admixtures are used in the production of all types of concrete products and dry building mixes, they are used as plaster binders in production. [26]. These additives have a flexible plasticizing effect and maximum adaptability to gypsum-based mixtures, which are used in the production of flat floors, in the production of small architectural products from building plaster, etc. [27].

Features of FREM NANOGYPS gypsum mixture additive:

- increase the movement of gypsum concrete samples;
- adjustment of construction plaster dough for no more than 15 minutes;
- The use of FREM NANOGIPS additives allows reducing the moisture content of mixtures by 2 times and increases the durability of the product by 2-6 times;
- the compressive strength of gypsum-concrete samples should not be less than 8 MPa in 2 hours;
- the compressive strength of gypsum concrete samples should not be less than 16 MPa in 1 day;
- the compressive strength of gypsum concrete samples should not be less than 16 MPa in 7 days.

Addition of FREM NANOGYPSUM additive is produced in the amount of 0.3-2.0% dry matter of gypsum binder. [28].

For the production of small architectural products from building plaster, it is recommended to add binders in the amount of 0.6-2.0%. In the production of flat floors, it is recommended to add 0.3-0.5%.

The optimal consumption of the cover depends on the composition and is selected in the laboratory by conducting test groups. Water gypsum level is about 0.26-0.32. For the first time, to determine the optimal S/G, the additives must be mixed with gypsum, and then water is added for the consistency of a thick cream. [29-100].

Table 2.1

NAME OF INDICATORS	TECHNICAL CHARACTERISTICS
	FRAME NANOGYPSUM
Appearance	White powder
Total density, g/sm^3	**0,650±0,020**
Weight percentage of dry matter, %	**98±0,5**
The beginning of the hardening time of gypsum paste, minutes	**15**
Composition of SI ions in dry matter by weight	**Not more than 0.1**

If a water layer is removed on the surface of the solid layer, the S/G ratio should be reduced.

Conclusions:

- Selected raw material products are suitable for carrying out the research and achieving the intended purpose and they meet the regulatory requirements.
- The selected research methods comply with the standards, allow conducting deep physical and mechanical research and are the basis for achieving the set goal.
- Experimental studies are conducted in laboratory conditions with all the necessary equipment and facilities that meet the current requirements. All material and technical resources are available for conducting research, the laboratory is provided with necessary regulatory documents.

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