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Manufacture of an Experimental Industrial Batch of Masonry and Plaster Construction Solutions with Superplasticizer SJ-1

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ABSTRACT: A new generation superplasticizer based on local raw materials is the study of the newest concrete structure and the development of innovative technologies. The scientific significance of the research results is determined by the method of obtaining a highly effective superplasticizer, determined by the polymer change in the country and the optimal synthesis conditions based on polycarboxylates, and the law of increasing the plasticizing activity of complex additives can be used to obtain new plastic additives. The practical significance of the work is manifested in the definition of a superplasticizer, which can be used as a superplasticizer as a dispersant of the mineral suspension in the regulation of the rheological properties of concrete mixtures. This will increase the resistance of cement, reduce cement consumption by 10-15% and reduce the import of superplasticizer for concrete and concrete products.

KEY WORDS: Complex chemical additive, small and large fillers, superplasticizing additives, physical and chemical properties of concrete, stability and deformability.

I. INTRODUCTION

The relevance and relevance of the topic of the thesis. In the world in the field of construction is increasing the share of using new types of environmentally friendly materials, the use of efficient energy-saving technologies. In particular, in developed countries such as the USA, Germany, and Japan, certain successes have been achieved in the creation and production of new building materials, and on this basis the improvement of the physical condition of buildings and structures, and all this is very important in the construction of buildings and structures since their strength and stability is ensured. In this regard, special attention is paid to the development of compositions of new building materials, in particular wall materials based on local raw materials and the creation of energy-saving technologies for their production [1].

Research is being conducted in the world aimed at increasing the strength, durability and resistance to different climatic conditions of wall ceramic materials, in particular, the use of various burnable additives to porous the structure and reduce the average density in the firing process, optimize the structure of materials by introducing mineral additives, creating and improvement of energy efficient technologies for their production. In this regard, issues of developing effective wall ceramic products based on low-grade local raw materials and using industrial and agricultural wastes, creating energy-efficient production technologies for such products [2] are of great importance.

In the Republic of Uzbekistan in the field of the building materials industry, large-scale measures are being taken to deepen economic reforms and accelerate the development of the industry, to increase the production of new modern building materials, structures and products, and certain positive results have been achieved. The development strategy of the Republic of Uzbekistan for 2017–2021 sets a very important task, in particular, increasing the competitiveness of the national economy and reducing energy and resource consumption in the economy, and the widespread introduction of energy-saving technologies into production [2].

II. SIGNIFICANCE OF THE SYSTEM

The scientific significance of the research results is determined by identifying the method of obtaining highly effective superplasticizers, chemical transformation of domestic polymers, as well as on the basis of polycarboxylates, optimal synthesis conditions are proposed, a pattern of increasing the plasticizing activity of complex additives is revealed,

which can be used to obtain new plasticizing additives.
The practical significance of the work is to identify the production of superplasticizers, which can be used to control the rheological properties of concrete mixtures, as dispersant mineral suspensions.

III. LITERATURE SURVEY

Introduction The composition of the pore solution varies significantly depending on the ratio of clinker and sulfate agent in the cement. This may depend on the nature and structure of the effective component in the superplasticizer, which affect the plasticizing effect of the superplasticizers. This should also be taken into account when choosing a superplasticizer in order to achieve the optimal initial plasticization effect and the duration of concrete plasticization [3].
Purpose of work. It is a study of the structure and development of innovative concrete technology with new generation superplasticizers based on local raw materials.
Materials and methods. Physico-chemical properties and chemical structure of superplasticizers are studied by IR and UV spectroscopy, differential thermal, X-ray phase and electron microscopic analyzes of cement compositions with new generation superplasticizers.

IV. METHODOLOGY

Results and discussion. In the manufacture of finishing composite mortars, Portland cement and varieties of Portland cement (pozzolanic, white and colored cements, etc.) are used as binders. To save cement use complex solutions consisting of two or more components. For the production of complex cement-based composite mortars, air lime and gypsum are used. Building gypsum is separately used as a mortar for interior and exterior decoration of buildings [4].
To improve the quality of building composite solutions, various mineral or polymer additives are introduced into their composition. Composite solutions should have sufficient compressive and bending strength, adhesion (adhesion) to the base, water resistance and frost resistance.
Designed finishing building composites:
1-for exterior finish lime-cement mortar with polymer additives - superplasticizer SJ-1.
2-for interior decoration a gypsum-sand mortar with polymer additives - superplasticizer SJ-1 [5].
The mobility of the mortar mixture, density, porosity, water absorption, stratification, water-holding ability, tensile strength in bending and compression, specific-impact strength, adhesive strength, thermal conductivity, dynamic modulus of elasticity (ultrasound method) were determined.

V. EXPERIMENTAL RESULTS

The following compositions of finishing composite solutions were investigated:
a) with the addition of SJ-1 superplasticizer by weight of binder in%: 0.2; 0.4; 0.6; 0.8; 1.0 respectively.
Prism samples 2x2x12 cm in size were subjected to a test to determine the specific toughness on a pendulum driver.
Samples of ½ brick size, on the surface of which mortar layers with a thickness of 5-7 mm were applied, were tested to determine the adhesive strength of a mortar with a brick on a portable DYNAZ-16 device made in Germany.
Samples of beams with dimensions of 4x4x16 cm were tested on a MII-100 instrument to determine the ultimate strength in bending and compression. The samples were tested to determine the strength and dynamic modulus of elasticity on a German Steikamp ultrasound device.
Samples measuring 15x15x1.5 cm were tested to determine the coefficient of thermal conductivity (λ) on the ITS-1 device.
The results of studies of the main properties of composite solutions with superplasticizer SJ-1 are given in table. 1 and 2 [6].

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Table 1
The main properties of gypsum mortar with the addition of superplasticizer SJ-1

№	Quantity SJ-1,%	OK, cm	ρ_0, g/cm^3	$R_{out.}$, (2ч), MPa	$R_{squ.}$, (2ч), MPa	$R_{out.}$, (28 s) MPa	$R_{squ.}$, (28 s), MPa	$W_в$, %	Speed v, m/s.	λ, W / (m.°C)
1.	Control.	6,1	1,85	3,0	10,1	6,5	12,2	11,3	46,8	0,38
2.	0,2	9,3	1,89	3,5	10,3	6,7	13,1	10,5	51,9	0,32
3.	0,4	10	1,88	3,1	11,0	6,0	14,2	10,0	52,6	0,27
4.	0,6	12	1,91	2,8	10,8	5,6	12,1	9,17	51,5	0,29
5.	0,8	14	1,87	2,8	9,4	5,5	11,4	8,77	49,7	0,44
6.	1,0	16	1,89	2,6	8,5	4,8	9,8	9,56	51,2	0,42

Table 2
The main properties of cement-lime mortar with the addition of superplasticizer SJ-1

№	Quantity SJ-1,%	OK, cm	ρ_0, g/cm^3	$R_{out.}$, MPa	$R_{squ.}$, MPa	$W_в$, %	Speed v, m/s.	λ, W / (m.°C)
1.	Control.	6,1	1670	1,04	3,65	16,5	69,6	0,23
2.	0,2	9,3	1750	0,94	3,52	17,2	77,5	0,39
3.	0,4	10	1740	1,22	4,83	17,2	70,2	0,21
4.	0,6	12	1750	1,17	3,86	16,7	74,4	0,24
5.	0,8	14	1740	1,05	4,61	17,1	69,5	0,23
6.	1,0	16	1720	1,10	4,92	15,8	67,9	0,34

Compositions and preparation technology of composite composite mortar with superplasticizer SJ-1.
Composition and method of preparation.
Compositions for the preparation of finishing mortars with increased workability with superplasticizer SJ-1 should be used according to table 3 and 4.

Table 3
Compositions of finishing composite mortars based on gypsum binder with superplasticizer SJ-1

№ п/п	Name components	Unit.	The composition of the solutions		
			№1	№2	№3
1	Gypsumplaster	%	35,6	35,6	35,6
2	Sand	%	36,1	36,0	35,9
3	Water	%	28,0	28,0	28,0
4	Superplasticizer SJ-1	%	0,3	0,4	0,5

Table 4
Compositions of finishing composite mortars based on cement-lime binder with super plasticizer SJ-1.

№ п/п	Name components	Unit.	The composition of the solutions		
			№1	№2	№3
1.	Portland cement	%	14,8	14,8	14,8
2.	Construction lime	%	4,8	4,8	4,8
3.	Sand	%	65,2	65,1	65,0
4.	Water	%	15,0	15,0	15,0
5.	Superplasticizer SJ-1	%	0,2	0,3	0,4

The preparation of composite mortars and the equipment used do not present any special difficulties, as in the production of traditional finishing mortars. This requires accurate dosage of the components (+ 1.0%, by weight) and strict adherence to the technological regime [7].
The preparation of composite finishing mortars is as follows:
–Dosage amount of astringent material, fine aggregate of SJ-1 superplasticizer and water moves in the forced action mixer according to the selected mode.
Conclusions. High mobility, density and strength of cement composites with SJ-1 were established. The optimal consumption of SJ-1 is 0.2-0.4% by weight of the binder. At the same time, consumption of mixing water decreases by 20-30%, which leads to an increase in brand strength by 15-20% at the age of 28 days. It should be noted that the introduction of SJ-1 into the composition leads to an increase in the strength of cement composites in the early stages of hardening. This leads to a simplification of the manufacturing technology of composites.

VI. CONCLUSION AND FUTURE WORK

Superplasticizers were obtained, which were synthesized on the basis of local raw materials and secondary resources, have a positive effect. It was revealed that the obtained superplasticizing additives are proposed to be used in the range of 0.1–0.5% by weight of cement.
Superplasticizers based on polycarboxylate ethers have been developed, providing increased strength, water resistance, heavy structural concrete by reducing the water-cement ratio, the formation of stable hydrate phases of cement stone.
Installed high mobility, density and strength of cement composites with SJ-1. The optimal consumption of the SJ-1 is 0.2-0.4% by weight of the binder. At the same time, the consumption of mixing water decreases by 20–30%, which leads to an increase in grade strength by 15–20% at the age of 28 days. It should be noted that the introduction of the SJ-1 leads to an increase in the strength of cement composites early in the hardening stage. This leads to a simplification of the manufacture of composites [8].
With a flow rate of SJ-1 of the order of 0.2 and 0.4%, the mobility of the composites is of the order of 12 and 20 cm, respectively, while the sediment of the cone of the control composition is of the order of 6.0 cm.
Based on the experience of industrial implementation, it has been established that the use of superplasticizers under production conditions is expedient from an economic point of view by reducing the consumption of cement and avoiding expensive alternative ways to improve the water resistance of concrete.

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