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STUDY OF THE PHYSICAL-MECHANICAL PROPERTIES OF FOAM - CONCRETE

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ABSTRACT

Foam concrete brands adopted the composition in relation to the amount of Foam concrete cement in the binder: for example: (the rest is mineral additives): Foam concrete -100 (100), Foam concrete -60 (60%), Foam concrete -50 (50), Foam concrete -30 (30%). With the increase of mineral additives, the strength of Foam concrete decreases, however, the strength of Foam concrete-30 is high enough and shows that it is higher than the strength of ordinary portland cement. This can be achieved by mechanochemical activation during dry grinding of Foam concrete components together with superplasticizer.

KEYWORDS

Introduction

In addition to the above-mentioned brands of foam concrete, we specified the brands of binders used in our scientific research, taking into account the mineral additives in their composition, as follows:

Penobeton (J)- 55 - contains 55% portland cement, low water-demanding binder prepared using Jarkurgan sand;

Consumption of raw materials in the production of traditional foam blocks: 230 kg of sand; 300 kg of cement; 180 l of water; 1.7 l of foam concentrate. 900 g of fibratola and 300 g of plasticizer are used for the production of 1 m3. Consumption of raw materials in the production of foam blocks from local raw materials: 210 kg of sand; 275 kg of cement; 150 l of water; 1.5 l of foam concentrate, 800 g of fibratola and 500 g of plasticizer are used for the development of 1 m3.

Production of foam blocks from raw materials in Surkhandarya region: 220 kg of sand; 290 kg of cement; 165 l of water; 1.6 l of foam concentrate, 700 g of fibratola and 300 g of plasticizer are used for the development of 1 m3

The properties of foam concrete were determined in accordance with the requirements of existing standards.

The speed of setting time of cement depends on a number of factors. Its mineralogical composition is of great importance, in particular, an increase in the amount of tricalcium aluminate leads to an acceleration of this indicator. Taking into account that the amount of tricalcium aluminate in the cement used in our scientific research was the same, Portland cement with a comparable surface area of 3200 cm2/g was used as a control sample. The specific surface area of foam concrete is 5000; 5300 and 5500 cm2/g were taken as equal. The normal density of the binders was determined using the Vika tool. It was found that the normal density of the control sample dough without superplasticizer made of cement with a surface area equal to 3200 cm2/g was 25.6%. The amount of water used for

the preparation of normal density cement paste made from the developed foam concrete showed a decrease of up to 28% compared to the control sample. It was found that the amount also affects. In the case of the control sample with a normal density of 25.6%, the start of the solidification time was 1 hour 32 minutes, and the end of the solidification time was 3 hours 50 minutes. It is known that with the increase in the fineness of the cement powder, its hardening time increases with the increase of the surface area. Also, with an increase in the amount of water in the cement paste, its setting time increases, while a decrease in the amount of water increases the setting time.

Table 1. Properties of foam concrete

T\r	Foam concrete brand	JK-02 amount of superplasticizer, %	Relative surface area, sm^2/g	Normal density, %	Solidification period, hour-min	
					Beginning	the end
1	PS-500	0	3200	25,6	1-32	3-50
2	Foam concrete-100	0,066	5000	19,6	0-25	1-30
3	Foam concrete-100	0,8		17,0	1-25	3-35
4	Foam concrete-300	0,4		16,3	1-30	4-35
5	Foam concrete(J)-55	0,6	5300	18,4	1-25	2-35
6	Foam concrete(J)-55	0,8		18,2	1-45	3-50
7	Foam concrete(J)-55	1,0		17,4	1-40	3-50
8	Foam concrete(J)-45	0,8	5500	19,5	3-30	5-30
9	Foam concrete(J)-45	1,0		18,0	3-30	5-35
10	Foam concrete(Sh)-55	0,6	5000	18,0	3-45	1-50
11	Foam concrete(Sh)-55	0,8		17,6	3-45	2-30
12	Foam concrete(Sh)-55	1,0		17,0	2-15	4-25
13	Foam concrete(Sh)-45	0,8		19,7	3-50	6-30
14	Foam concrete(Sh)-45	1,0		18,7	2-40	7-00
15	Foam concrete(J+Sh)-50	0,8		19,0	1-45	2-30
16	Foam concrete(J+Sh)-50	1,0		18,3	1-40	3-30

This can be explained by the fact that the superplasticizer reduces the forces of attraction between solid particles in the cement-water paste. The superplasticizer forms an adsorption layer on the surface of the cement particles, creating electrostatic repulsion and reducing the viscosity of the system. It was found that an increase in the amount of silica-containing component in foam concrete also leads to an increase in the hardening time. It was found that the amount of superplasticizer has the most significant effect on the hardening time in all studied foam concrete compositions.

Naturally hardened foam concrete -100, i.e., the composition of which consists of only Portland cement clinker and 3% gypsum stone, reaches 20 to 23% of its 28-day strength in 1 day, from 53 to 58% in 3 days, and from 68 to 77% in 7 days, respectively. was determined. It should be noted that the composition with 0.8% superplasticizer showed the highest strength in 28 days - 56.3 MPa, and 23% of the 28-day strength in 1 day according to the setting time, 3 reached 53% in 1 day and 68% in 7 days. According to the results of hot-moist treatment of foam concrete with these compositions, we can note the following:

It was found that heat-wet treatment has a positive effect on the strength of foam concrete. All samples of Penobeton-100 hardened by hot-wet treatment achieved almost 2 times higher strength compared to the strength of samples hardened in natural conditions after 28 days. It was found to achieve 77% strength compared to 28-day strength when tested after heat-wet treatment.

In our further research, the mixture consisting of 55% Portland cement, 42% Jarkurgan sand with 0.6, 0.8 and 1.0% superplasticizer was crushed until it had a specific surface area of 5300 cm2/g and 5500 cm2/g. (J)-55 received. Samples were prepared from the prepared foam concrete (J)55 to determine the strength. Prepared samples were stored in laboratory conditions until testing. At the same time, the samples prepared from the same composition were subjected to hot-moist treatment and stored in laboratory conditions.

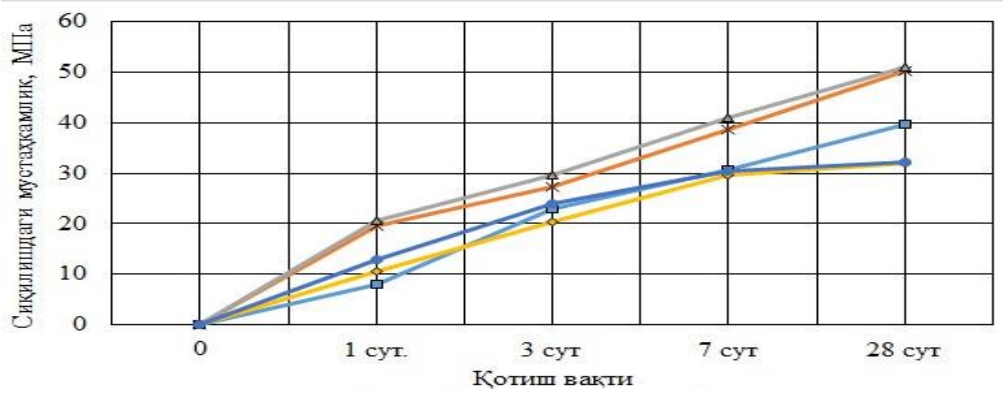

Figure 1. Strength of hot-moist processed foam concrete(1;2;3;4;5:)

Changes in strength of hot-wet treated foam concrete-100 over time. Samples prepared from the binder with a specific surface area of 5300 cm2/g of foam concrete (J)-55 in natural conditions showed a 7.9 to 20.6% of the 28-day strength in 1 day, from 54.5 to 58.3% in 3 days, respectively. and it was determined to reach from 77.1 to 80.4% in 7 days. It should be noted that the composition containing 1.0% superplasticizer showed the highest strength index of 50.9 MPa in 28 days.

Samples made of foam concrete (Ж)-45 with Portland cement clinker in binder content of 45% and 0.8% superplasticizer with a specific surface area equal to 5500 cm2/g have a strength of 31.9 MPa. showed. When the amount of superplasticizer in the composition of the binder is increased by 0.2%, that is, when it is 1.0% compared to the total mass, it was found that the strength of the binder containing 0.8% superplasticizer is lower by 1.3% .

The following lines were determined in the IK-spectrum of the received foam concrete with optimal composition (Fig. 3.2.2) 3468, 3434, 2927, 2523, 1633, 1440, 1066, 878, 722, 606, 463, 434, 400, 294, 252 sm^{-1}.

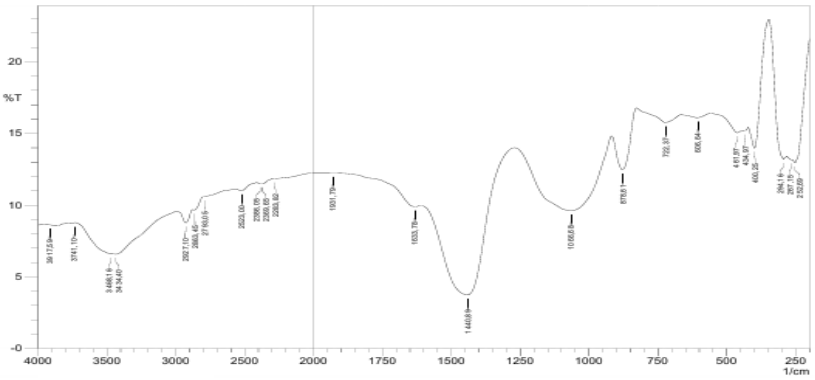

Figure 2. IK-spectrum of foam concrete with optimal composition

High-frequency lines in the area of 3300-3515 cm-1 correspond to hydroxyl groups. Lines in the area of 1200-800 cm-1 with maxima corresponding to 722-463, 3468-3443 cm-1 indicate the presence of hydrosilicate phases. The lines corresponding to 876 cm-1 confirm the formation of sodium-calcium hydrosilicates of the Si-O-Na bond type in the composition of the compounds formed during the hydration of foam concrete and the fact that the hydration process took place 772-611, 606 cm -1 lines correspond to a- quartz mineral. The presence of quartz and other modifications of SiO2- is confirmed by lines in the area of 830-750 and 450-400 cm-1.

So, during the hydration processes that take place during the hardening of polystyrene concrete, low-base hydrosilicates, hydroaluminates and hydrocarboaluminates are formed. These minerals change the structure of foam concrete and increase its strength.

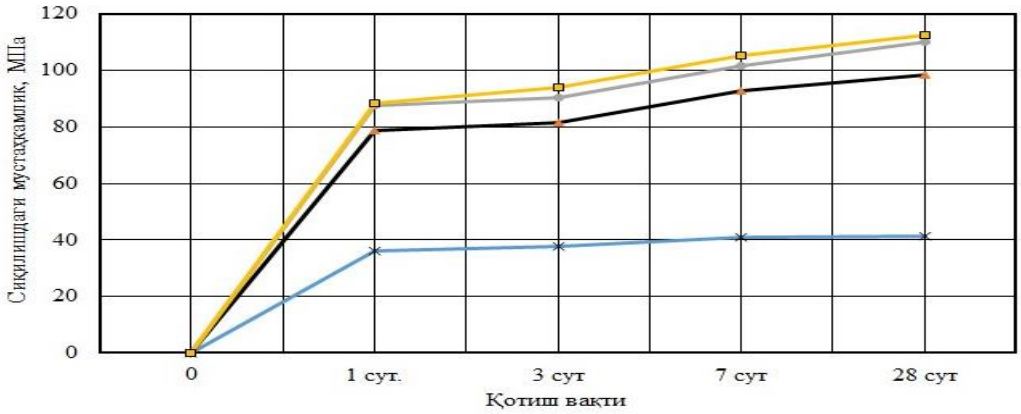

Figure 3. Changes in the strength of foam concrete over time. (1;2;3;4)

Changes in strength of Zhargorgon sandy foam concrete hardened in natural conditions over time.

It should be noted that hot-wet processing of Penobeton prepared using Jarkurgan sand has a positive effect on their GOST initial strength, and the later strength shows the possibility of reaching 83% of the 28-day strength. The effect of hardening conditions on the strength of both under natural conditions and after hot-moist treatment was studied.

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