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Properties of Low Water-Demanding Binder (LWDB) Materials Using Fly Ash

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Abstract: *Analysis of experimental studies shows that Taking into account the effect of mechanic activation in the system "Cement clinker - residual ash of the Angren heat energy station, dune sand, super plasticizer and water", the technological properties and the mechanism of structure formation are determined. Scientific experimental data have shown that the activity of modern super plasticizers and additives of residual ash (dune sand) during the joint crushing of Portland cement clinker and gypsum stone under normal conditions on the 28th day of hardening is up to 69 MPa (when using dune sand) and 87 MPa (using residual ash) that a binder can be obtained.*

Keywords: *low water-demanding binder, super plasticizers, dune sand, fly ash.*

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1. Introduction

Low-water-consuming binders, which allow saving Portland cement clinker in the production of cement, using the potential of local raw materials and industrial waste in the production of building materials, products and structures in conditions of a shortage of high-quality natural resources, using them, the development of optimal technologies is an urgent task. It is important to further deepen economic reforms in the building materials industry, improve and develop production, take comprehensive measures to achieve their results at the present stage, comprehensive and rational use of local raw materials and full use of waste generated in various industries.

Mechanical activation of cement clinker makes it possible to achieve high savings in cement due to the introduction of finely divided active mineral additives, increasing the softness of the binder and the use of super plasticizers. Factors related to the creation of new generations of cement, the use of innovative technologies, the reduction in the use of high-quality raw materials, the increase in industrial waste of raw materials and the intensification of environmental problems are the main reasons for the rational use of various mineral additives. In cement and concrete products is essential for evaluating its effectiveness in application [1, 2].

The development of low-water-consuming binders based on active mineral additives, such as angerene ash, silica, slag from industrial waste in raw materials available in Uzbekistan, is an urgent issue when choosing their optimal composition, studying their basic properties. Energy saving, a number of scientific and practical results have been achieved in the world on the basis of less water-consuming binders.

2. Materials and methods

The study of the properties of raw materials KTS Binders at the department "Production of building materials, products and structures" of the Samarkand State Institute of Architecture and Civil Engineering The study of the formation of structures in materials was developed in the laboratories of the Institute of Building Materials and Chemistry.

The processes of grinding binders KST were carried out in vibratory mills and roller mills MLR-15. (Figure 1.1).

Figure 1.1. Vibratory mills and roller mills MLR-15

STANDARD R310.4, STANDARD 30744 and EN 196-1 are used to test cement samples in accordance with regulations. This MLR-15 mill is a reliable device, tried and tested for many years of working with cement. Used to test gypsum binder samples according to STANDARD 23789.

Mill MLR-15 has a number of conveniences, such as a digital convenient counter in the process, allowing you to control the time remaining until the end of the process.

No. 008 STANDARD 6613 Connector softness control is made in the form of a square wire [3].

The analysis of scientific data on the study of KSTB showed that the use of super plasticizers based on polycarboxylates for the production of LWDB and MMT cements is inappropriate, their action is based on the rheotechnological effect, which is associated with a decrease in their plastic properties as a result of mechanical impact during crushing. With this in mind, the super plasticizer Mega last ZhK-02, consisting of polymethylenephthalenesulfate acids of different molecular weights, was used as a chemical additive in the production of LWDB.

To study the effect of a super plasticizer on the normal density of Portland cement dough, Portland cement was first obtained by crushing 5% gypsum in Portland cement clinker to determine the activity of Portland cement clinker. 25.6% of water was used in relation to the mass of Portland cement to obtain a test of normal density from crushed Portland cement with a specific surface area of 3200 cm^2/g. The start and end time of its solidification was 1 hour 32 minutes and 3 hours 50 minutes, respectively. To determine the strength, the samples were hardened by wet heat treatment, and the strength of the samples after 1 day was 36.3 MPa (Table 1). After 28 days of laboratory testing, the compressive strength of the samples was 41.5 MPa.

Table 1. Influence of Super plasticizer on Normal Thickness and Hardening Time of Portland Cement

№	Amount of clinker, %	gypsum %	Amount of supet, %	Surface area, sm^2/g	W/C, %	Hardening -time	
						start	end
1	95	5	0	3200	25,6	1-32	3-50
2		5	0,6	5000	19,6	0-25	1-30
3		5	0,8	5000	17,0	1-25	3-35
4		5	1,0	5000	16,3	1-30	4-35

The rheotechnological properties of binder compositions depend on how the properties of the binder are used. Therefore, our further studies were focused on the effect of the super plasticizer on the properties of KSTB-100. 0.6 in relation to the mass of the binder super plasticizer; With the addition of 0.8 and 1.0%, the composition was mixed with 95% Portland cement clinker and 5% gypsum stone to a specific surface area of 5000 cm2/g. Dough of normal thickness was prepared from finely dispersed mineral binders, the hardening time was determined, and samples 4x4x16 cm in size were made from a binder-sand mixture in a ratio of 1:3, which determines the compressive and bending strength [4].

Table 2. Influence of LWDB type, specific surface and amount of super plasticizer on the curing time of the binder

№	LWDB mark	Amount of superplastificator, %	Surface area, sm^2/g	Normal Thickness, %	Hardening -time, Hour-min	
					star	end
1	PC-500	0	3200	25,6	1-32	3-50
2	LWDB -100	0,6	5000	19,6	0-25	1-30
3	LWDB -100	0,8		17,0	1-25	3-35
4	LWDB -100	1,0		16,3	1-30	4-35
5	LWDB (B)-55	0,6	5300	18,4	1-25	2-35
6	LWDB (B)-55	0,8		18,2	1-45	3-50
7	LWDB (B)-55	1,0		17,4	1-40	3-50
8	LWDB (B)-45	0,8	5500	19,5	3-30	5-30
9	LWDB (B)-45	1,0		18,0	3-30	5-35
10	LWDB (M)-55	0,6	5000	18,0	3-45	1-50
11	LWDB (M)-55	0,8		17,6	3-45	2-30
12	LWDB (M)-55	1,0		17,0	2-15	4-25
13	LWDB (M)-45	0,8		19,7	3-50	6-30
14	LWDB (M)-45	1,0		18,7	2-40	7-00
15	LWDB (B+M)-50	0,8		19,0	1-45	2-30
16	LWDB (B+M)-50	1,0		18,3	1-40	3-30

3. Result and discussions

Based on the results obtained, it should be noted that the start and end time of curing of the binder prepared with the addition of 0.6% superplasticizer is significantly less than that of the control sample, i.e. without superplasticizer, and can be 25 min. and 1 hour 30 minutes respectively. This can be explained by the degree of softness of Portland cement and the resulting increase in the number of active particles in the binder. The compressive strength of these samples was 2.16 times higher than that of the control sample after heat-moisture treatment and 2.38 times higher than that of the control sample after 28 days of laboratory curing.

This can be explained by a decrease in the porosity of the cement stone due to a decrease in the water-cement ratio due to the use of a superplasticizer [5].

By increasing the specific surface, the researchers found that the strength of crushed cements with a specific surface of more than 5000 cm2/g at different hardening times differed slightly, i.e. on the second day of hardening, the strength was 5-10%. above the consistency will be the same. Taking into account economic and technological indicators, the optimal specific surface area can be calculated in the range of 5000-5500 cm2/g.

4. Conclusion.

According to the results of the above experiment, as rheotechnological properties, the properties of dry or hard rocks that occur during the joint crushing of such components as microsilicon-dune sand-superplasticizer were studied, and the conditions in this process were considered rheotechnological processes. .

It should be noted that finely divided fractions of sand and carbonate rocks are used as additional components that activate hardening processes in the production of cement. The optimal quantitative content of additives in cements is 25-60% (carbonate rocks); 20-30% (sand of various mineralogical composition). Cements with such additives are called carbonate and sandy, respectively.

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