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Low Water-Demanding Binder Properties on Base Angren Residual Ash

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Abstract: *Analysis of experimental studies shows that the application of mechanical and chemical principles and the effect of a highly effective mechanism of action of chemical additives, first of all, the use of finely divided active mineral additives and super plasticizers, the emergence of types of binders, low-temperature application, when obtaining cement composite technology, such characteristics like high density, durability, uniformity, are the latest research papers that are missing. 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: *Binder, super plasticizers, dune sand, residual ash.*

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Introduction

The construction industry in the country is developing dynamically, the quality of building materials, products and structures is improving, their diversity is increasing, new modern technological methods are being introduced, and innovative technological systems are being introduced. There is a growing demand for the construction of residential, industrial and communication facilities. Therefore, one of the main tasks is to solve the problem of production based on high-quality, cheap local raw materials and industrial waste. Therefore, it is necessary to introduce innovative technologies in the production of building materials and a comprehensive study of their application [1].

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.

Research is underway to develop new compositions of secondary raw alkaline compounds, improve their physical and mechanical properties, improve the special properties of products, obtain energy-saving materials and optimize their structure, as well as reduce the average density of products. Of great importance is the production of new concrete binders and energy-saving materials, in particular foam concrete, based on chemical waste and secondary raw materials. Studies of low-water-consuming binders and foam concretes based on them in the world's leading scientific centers and universities, including Moscow State University of Civil Engineering, St. Petersburg State University. Higher Technological University, Kazan State University of Architecture and Civil Engineering, Kuzbass State Technical University, Penza State University of Architecture and Civil Engineering, Rostov State Engineering University (Russian Federation), Institute of Geopolitics (France), Boxau University of Weimar (Germany), Prague University of Chemistry and Technology , Valleuniversiteti (Colombia), University of Seville. (Spain), National Technical University of Athens (Greece), Clemson University (USA), Punjab Agricultural University (India), Bucharest Polytechnic University (Romania),

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

Portland cement clinker and Portland cement are mainly used in the mechanical activation and production of low water-demanding binders (LWDB). The hydraulic binder, which is formed from gypsum, and in some cases special additives, by firing the clinker until it is partially melted, is called Portland cement.

Cement clinker (clinker) is a small piece of rock obtained by roasting raw materials of the appropriate composition to partially melt and melt the mixture, mainly high silicate and high-low-low aluminate, partially melted and hardened by melting [2].

In scientific research on the production of low water-demanding binders, Portland cement clinker and Portland cement of Kyzylkumcement factory were used. Used Portland cement clinkers fully comply with the requirements of UzDST 2801:2013. (table 1 and 2)

Table 1. Chemical composition of red sand cement clinker, (%)

Production factory	CaO	SiO_2	$A1_2O_3$	Fe_2O_3	MgO	SO_3	heating loss, (%)
“Kyzylkumcement”	65,58	20,64	7,23	4,36	0,84	0,65	-

Dune sand was used to keep the clinker in the binder when producing a binder with low water demand.

Table 2. Mineralogical composition of clinkers,(%)

Production factory	C_3S	C_2S	C_3A	C_4AP	CaO	modulus	
						silicate	alumina
“Kyzylkumcement”	62	15	10	13	0,15	2,0	1,5

Table 3. Sedimentary composition of ash from Angren CHP.

Name	Consist of minerals								
	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Na_2O+K_2O		tot
Flying ash	35,80	18,45	15,30	18,30	4,15	3,80	0,5	3,7	100

Dune sands. In the Central Asian region, including the southwestern borders of the Republic of Uzbekistan, i.e. along the rivers of the Amu Darya, in the desert regions of Ustyurt, Karakalpakstan, Khorezm, Navoi, Bukhara, Surkhandarya, Kashkadarya, Jizzakh regions, fine-grained sand dunes are widespread. The chemical and mineralogical composition of some mining sands of the Republic of Uzbekistan is given in tables 4 and 5. Dune sand density in Uzbekistan $\rho = 2.35 \div 2.63$ g/cm^3, bulk density = 1.25 ÷ 1.38 g/cm3, porosity 42 ÷ 47%, specific surface area Sc = 2.6 ÷ 2 .72 g/cm^3, magnitude modulus Mk = 0.41-0.49 [3].

Based on the analysis of the data presented a comparison was made of the chemical composition of dune sands on the territory of the Republic of Uzbekistan.

To obtain low water-demanding binders, barkhan sand of the Varakhshan deposit of the Bukhara region was used. The grain composition of dune sands of the Varakhshan deposit is shown in Table 6.

Table 4. Chemical composition of dune sands (%)

T/p	Dune sand plants	Chemicals, %							Loss, (%)	Dust, (%)
		SiO_2	$A1_2O_3$	Fe_2O_3	CaO	MgO	SO_3	Na_2O+K_2O		
1	Kokand, Uzbekistan	59,6-68,0	7,5-43,7	1,8-3,5	4,5-12,9	1,3-3,71	0,1	4,1-5,0	6,0-9,0	1,0-5,0
2	Buvaydin, Uzbekistan	62,8-67.0	12,0-12,8	2,4-3,0	6,0-6,4	2,3-2,5	0,25-1,8	4,4-5,3	6,6-7,7	0,2-8,0
3	Dashnabod, Uzbekistan	60,0-71,7	2,2-10,7	2,0-3,2	6,0-10,9	0,8-2,4	0,3-3,2	2,4-3,8	5,4-8,8	1,2-13,7
4	Qoraqum, Uzbekistan	60,0-68,3	8,8-12,6	2,0-4,8	7,3-11,8	0.82-3,12	0,0-0,02	2,0-5,9	5,8-13,8	2,0-4,0
5	Varaxshon, Uzbekistan	69,54-70,0	7,81-8,0	2,6-3,0	7,5-7,6	1,0-2,4	0,3-0,21	1,0-2,0	6,0-7,5	2,0-3,6

Table 5. Mineral composition of dune sand (%)

Name of minerals	Dune sand fraction size, mm						The main amount of sand, (%)
	0,5÷0,25	0,25÷0,10	0,1÷0,05	0,05÷0,01	0,01÷0,005	<0,005	
Quarts	60,0	52,77	45,75	45,75	40,0	31,3	48,0
Feldspar	5,0	12,6	11,76	11,93	10,0	30,6	30,5
Carbonate	-	0,72	11,18	51,82	40,0	2,7	13,0
Mica	-	-	-	6,08	10,0	37,4	2,5
other	35,0	35,7	31,31	4,14	-		6
total:	100	100	100	100	100	100	

Table 6. Grain composition of dune sands of Varakhshan mining

	Fraction of sand, mm						
Size, mm	1-0,5	0,5-0,25	0,25-0,1	0,1-0,05	0,05-0,01	0,01-0,05	<0,005
amount, %	-	0,2	44,71	15,3	18,1	4,3	17,4

3. Result and discussions

Binder grades LWDB are accepted depending on the amount of clinker in the binder: for example: (the rest is mineral additives): LWDB -100 (100% clinker), LWDB -60 (60% clinker), LWDB -50 (50% clinker), LWDB - 30 (30% clinker). With an increase in mineral additives, the strength of LWDB decreases, but the strength of LWDB -30 is quite high, which indicates that it is higher than the strength of ordinary Portland cement. This can be explained by the fact that the components of LWDB in combination with superplasticizers make it possible to achieve mechanical and chemical activation due to dry grinding [4]. In addition to the above grades LWDB and MMTcement, we have defined the grades of binders used in our research, taking into account their mineral composition, as follows:

- LWDB (B) - 55 - contains 55% Portland cement clinker, a low-water-intensive binder, made on the basis of dune sand;
- LWDB (M)-55 - contains 55% Portland cement clinker, a low water-intensive binder made using residual ash;
- LWDB -50 - contains 50% Portland cement clinker, a low-water binder, prepared using equal amounts of dune sand and residual ash.

The properties of the LWDB were determined in accordance with the requirements of the current standards. The rate of cement curing depends on a number of factors. Of great importance is its mineralogical composition, in particular, an increase in the amount of tricalcium aluminate leads to an acceleration of this indicator. Given that the amount of tricalcium aluminate in the clinker used in our research was the same, Portland cement with a specific surface area of 3200 cm^2/g was used as a control sample. Specific surface area of LWDB 5000; 5300 and 5500 cm^2/g were taken as equal. The normal thickness of the binders was determined using a Vika instrument. The normal density of the test sample without superplasticizer from cement with a specific surface area of 3200 cm^2/g was 25.6%. It should be noted that not only their size, but also the type and amount of mineral additive, as well as the amount of superplasticizer, affect the curing time of LWDB.

The solidification start time was 1 hour 32 minutes, the solidification end time was 3 hours 50 minutes at a normal density of the control sample of 25.6%. It is known that the setting time of cement powder increases with increasing relative surface area with increasing degree of grinding. In addition, as the amount of water in the cement paste increases, the curing time increases, and as the amount of water decreases, the curing time increases. An increase in the amount led to an increase in the curing time of the binder [5].

4. Conclusion.

It has been established that an increase in the amount of residual ash component in the composition of LWDB also leads to an increase in the curing time. It has been established that the amount of superplasticizer has the most significant effect on the curing time of all components of the studied LWDB. It has been established that heat treatment has a positive effect on the strength of the LWDB. After 28 days, all samples of the heat-strengthened binder LWDB reached almost 2 times greater strength than those frozen in natural conditions. When tested after hot and wet processing, strength was found to be 77% compared to strength after 28 days. Theoretically studied the factors and properties of binders in the production of binders, such as dune sand, microsilicon, superplasticizer, and identified practical aspects of choosing the optimal composition for research.

The possibility of increasing the strength of the cement stone by 40-45% due to the modification of cement with 25-30% fine particles during the mechanical activation of LWDB obtained as a result of the joint crushing of dune sand, microsilicon.

5. References.

1. Yusupov H.V. Features of properties in concrete mixes on the basis of VNV in the conditions of a dry hot climate the dissertation on sois. uchen, step, can^ tech. Sciences. M.: - 1993
2. Yusupov Kh.V., Matyazov S.M. Concrete on base low water demanding binder April 12-14, 1995 Samarkand-1995 90-92 p.
3. Yusupov Kh.V., Negmatov Z.Yu., Dadaev D.M. Features of the properties of concretes based on multicomponent binders in a dry hot climate. International scientific and practical seminar

"Cadastral, service and the problem of development of the real estate market" (April 19-20) Samarkand. 2002 59 p.

4. Yusupov Kh.V., Tillaev T.N. Efficiency of application of ferrochrome slags as a part of VNV. “Memorchilik va Qurilish Muammolari” Ilmiy Technician magazine. No. 3., 2005. 57-59 betlar.
5. Yusupov H.V., Tillaev T.N. Influence of the concentration of superplasticizer J K-02 on the activity of VNV from cements with different aluminate components. SamDMKI. Samarkand. 2005 45-46 з.