International Journal of Advanced Academic Studies 2020; 2(2): 160-163

E-ISSN: 2706-8927
P-ISSN: 2706-8919
www.allstudyjournal.com
IJAAS 2020; 2(2): 160-163
Received: 26-01-2020
Accepted: 27-02-2020

TA Atakuziev
Tashkent Chemical Technology Institute, Uzbekistan

MG Bekmuratova
Tashkent Chemical Technology Institute, Uzbekistan

NS Raxmatova
Tashkent Chemical Technology Institute, Uzbekistan

NE Shamadinova
Tashkent Chemical Technology Institute, Uzbekistan

Corresponding Author:
TA Atakuziev
Tashkent Chemical Technology Institute, Uzbekistan

Multi-Clink low-brick cements with use of solid and liquid waste soda production

TA Atakuziev, MG Bekmuratova, NS Raxmatova and NE Shamadinova

Abstract
In this article tests of using solid waste of soda production of cement are stated. Results of firm soda productions on durability of multicomponent cement, results of laboratory researches are given. Set optimum compositions of multicomponent low-clinker cements. Therefore, it is recommended for application in quality production of cement, improving its horizontal-technical properties.

Keywords: Firm and liquid waste, phosphite, lime, slag, layage, plaster, grinding.

Introduction

Production of multicomponent cements has a future, but the main difficulty of receiving them is unpredictability of influence of materials, nonconventional for the cement industry, on properties of knitting.

Lack of granulated electrothermo phosphoric slag in Uzbekistan predetermined need of research and studying of local materials and waste of the industry for partial replacement of slag.

Fine solid carbonate and liquid waste of soda production was used. Influence of carbonate solid waste on durability in actual practice, i.e. in mix with clinker, granule slag and plaster specified in table No. 1

The analysis of the table allows to draw a conclusion on a possibility of replacement to 15% of the granulated slag with waste of the soda plant.

Insufficient durability of multicomponent cement (MC) in initial terms after the active introduction in process of hydration of mineral additives is compensated to MKTs possess also lowered amount of water for normal density of the cement test and the smaller water cement relation. Also the possibility of decrease plaster content in them to 35 is set that, however slightly slows down increase of durability in early terms. Besides chloride salts of calcium and sodium, as we know, also affects activation of processes of solidification and hydration of multicomponent cement.

Despite increase in total production of cement in Uzbekistan a number of fields of construction feels deficit in cement.

Considerable decrease in deficit of cement can be reached due to use of multicomponent low-brick cements which depending on the construction and technical properties, will find broad application, both in the industry, and in civil engineering. For production of such cements techno genic by-products of different industries can be used. [1]

We studied possibilities of use of fuel slags of the Angren state district power plants, foundry slags, the fulfilled forming masses (FFM) and argilla for receiving the multicomponent cements containing from 15 to 20% of Portland cement clinker. [8]

In selecting materials and developing compositions of cements proceeded from conditions of not deficiency of initial raw materials and limitlessness of its stocks that predetermines a possibility of the organization on its basis of industrial production of multicomponent cements. Data of chemical analysis of the studied materials (table 2.) show that the content of new oxides in them changes in wide range.

The ratio of the components ensuring the production of phosphogypsum-lime calcines containing calcium oxide with reduced hydration activity was considered to be the optimum composition of the raw material mixture; as a result, the maximum expansion effect of the Portland cement expansion additive was achieved within 3-10 days.

Studying the mixes with a different ratio of components of a phosphite (10-90%) and малкаго lime clearing withdrawal (90 - 10%) allowed to set the structures having the greatest effect of expansion. They correspond to the content of 60-50% of small withdrawal of clearing of lime. At increase in quantity of a phosphite the content of free oxide of the calcium providing расширениегидратирующейся systems decreases. [5-6]. Increase in number of melky withdrawal of clearing of lime leads to formation of oxide of calcium of an active form. With increase in quantity of a phosphite in raw mix temperature of receiving a phosphite – limy spek decreases.

New types of the straining cements can be received by introduction of a phosphogypsum – lime sinter in a Portland cement. The physical and chemical and physical-mechanical processes happening at solidification of the received straining cements, considerably depend on chemical and mineralogical composition of initial Portland cement. [4]

A study of the hardening process of Akhangaran Portland cement with the addition of phosphogypsum - lime stacks made it possible to determine the effect of the expanding additive on its hydration.

Stress cement based on Portland cement clinker and phosphogypsum-calcareous sinter was obtained by co-grinding them in the required ratio in a laboratory ball mill to a specific surface of 3000-3200 gm^3/g.

Receiving the straining cement – introduction of phosphogypsum – lime sinter to a ready portland cement expands in other way a scope of such additive. In this case additive can be entered into a portland cement directly on site of production of solution and concrete [2]. In this case sintered with a specific surface 3000-3200 cm^3/g in necessary quantity mixed up in mixing drums with a portlandtsement within 30-40 min. for the purpose of uniform distribution of the straining additive in volume of the straining cement.

Alithic Portland cement of the Akhangaran cement plant (A) was used as a starting material for the production of tensile cement.

As an expanding additive, crushed phosphogypsum-lime sinter of composition 60A was used.

The obtained tensile cements were researched to study from physico-mechanical characteristics.

The maintenance of phosphogypsum - calcareous sinter in the Portland cement-water system affects the physicochemical characteristics of the cement stone. The change in physical and mechanical characteristics depends on the strength and composition of the phosphogypsum-calcareous sinter, as well as on the type of survivor, on the basis of which an annoying portlancement is obtained.

Important indicators determining the possibility of using tensile cements in a production environment are setting time and uniformity according to the standard method of GOST 310.76. at the same time, the influence of cakes on water demand was studied, the setting time and the change in the volume of stress cement (table 4.). with the introduction of phosphogypsum-calcareous sinter with a high content of gypsum (60A and 50A), water demand slightly increases, and with an increase in the amount of additive from 5 to 15%, water demand decreases.

Сроки схватывания при введении фосфогипса-известковых спёков в клинкер соответствуют требованиям ГОСТ 10 178-76. Поэтому дополнительно вводить гипс при помоле напрягающего портландцемента нет необходимость. Сроки схватывания зависят от количества гипса в составе добавки.

Setting terms at introduction of a phosphogypsum – lime sinter in clinker conform to requirements of GOST 10 178-76. Therefore in addition to enter plaster at a grinding of the straining portlandtsement there is no need. Terms of a skhvatyvaniye depend on amount of plaster as a part of additive.

The time is slowed down when the amount of phosphogypsum - lime sinter is increased to 5-15%, which is associated with an increase in the content of gypsum introduced in the sinter. The difference in the start time of cement setting with the addition of gypsum and phosphogypsum - signified sinter at the same gypsum content (and in terms of SO_3) can be explained by the different solubility of anhydrite, in the form of which gypsum is in sintered and bivalve gypsum. The uniformity of the volume change is violated by the introduction of phosphogypsum-calcareous sinter in an amount of 15%.

Table 1: The influence of solid waste from soda production on the strength and other characteristics of multicomponent cement

№ Structure	Structure of MC, mass %				Specific surface, cm^2/g	Setting time, h/min		Normal cement density	bend durability, MPa, day		Durability at compression MPa, days	
	clinker	Mineral white	Pellet slag	TOS		Beginning	end		3	28	3	28
1	50	5	45	-	3000	1-50	3-05	24,75	4,5	6,2	23,	45,4
2	50	5	37	8	3380	2-40	3-50	24,10	4,5	6,4	23,3	51,8
3	50	5	30	15	3360	3-00	4-05	23,50	4,6	6,3	23,6	48,9
4	50	5	32	15	33500	2-25	3-30	23,60	4,1	6,0	20,2	48,1

Table 2: Chemical characterization of materials used in cement production

Material	Primary in the production of material,%	Chemical composition, % by weight							
		SO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Na_2O	K_2O
Glizh (average sample)	0,60	78,24	12,16	17,16	3,17	0,49	0,05	0,28	0,50
Angren Slag GRES	-	40,0	17,16	14,80	19,10 5,50	10,90	4,90	1,20	1,20
Воллоатонит	3,60	47,40	14,80	1,79	0,71	45,76	0,39	0,1	0,19

Table 3: Optimal compositions of multicomponent low-clinker cements

Cement composition	Amount		Setting time, h, min		Strength, Mpa					
	Distiller liquid, %	wollastonite%	begin	end	At a bend, day			At compression, day		
					7	28	90	7	28	90
Gliezh	-	-	3-45	4-35	1,5	2,8	3,7	5,2	13,1	20,0
	3	5	-	-	2,0	3,5	4,6	7,0	14,1	25,0
Foundry slag	3	5	-	-	2,2	4,5	5,5	7,1	17,0	27
Angren Slag GRES	3	5	-	-	3,9	5,8	7,1	21,0	30,7	40,1
Optimal form (composition) of a multicomponent	3	5	-	-	4,2	6,7	8,2	22,3	33,1	42,0

Table 5: Influence of sinter on water requirement, terms of a setting time and change of volume of the straining cement

Additive	Additive amount,%	Normal density %	Setting time, min.		Uniformity of change
			begin	End	
Mineral white 60A	5	33	110	290	Curiing
	10	33	145	330	
	15	32	150	350	Friction chain
50A	5	33	85	280	Sustained
	10	33	115	295	
	15	32	135	315	Friction chain

Mechanical durability of a cement stone was studied on cubes with height of a rebor of 1.41 cm made of the test of normal density. Results of researches are presented in table 5. From where it is visible that introduction of a phosphogypsum – lime sinter in clinker of the ordinary portland cement brings to some to decrease in durability into early terms of solidification [7]. Some increase in extent of hydration of clinker minerals when using spyok 60A and 50A leads to increase in quantity of the gelevidny new growths determining durability of a cement stone in later terms of solidification.

The increase in the strength of a cement stone with an increased content of calcium oxide can be explained by the binding of a significant amount of water during the hydration of calcium oxide, which leads to a decrease in the water-cement ratio.

Table 5: Influence of siren on mechanical property straining cement on the basis of ordinary cement.

Additive	Amount of additive %	The ultimate tensile strength, MPa, in a day				
		1	3	7	28	720
Mineral white 60A	5	7,5	32,5	42,1	66,9	74,6
	10	6,0	29,5	45,0	56,5	75,2
	15	3,0	21,	32,5	57,2	66,4
Mineral white 50A	5	3,7	18,8	41,02	58,6	78,2
	10	5,2	19,0	34,1	41,5	75,1
	15	3,7	22,0	43,5	69,8	82,3
		7,0	23,5	38,6	45,0	89,0*

*- small surface friction chain

In all cases, the optimal amount of additive can be considered 10%, since it is with this amount of additive that the required amount of $CaSO_4$ gets into the sample. An increase in the amount of additives to 15% leads to a decrease in the strength of samples in the early stages of hardening and to cracking out at a later date due to significant linear elongation. With an increase in the content of free calcium oxide in the sinter, the limit of the possible amount of introduction of the additive decreases.

After 8-28 days of hardening, the strength characteristics of the samples with the addition of gypsum and the addition of phosphogypsum-lime sinter are equalized, and by two years of hardening, many samples with the addition of sinter have higher strength than the strength of the samples with the addition of gypsum. In this case, the optimal composition is that containing sinter 50A as an additive, the strength of which exceeds the strength of the composition with gypsum 10-20%.

In the Table 6. The results of the study of the effect of phosphogypsum-calcareous sinter on the strength of cubed samples based on alite potassium cement are presented.

Table 6: The effect of phosphogypsum-calcareous sinter on the strength of samples based on alite Portland cement.

Additive	Amount of additive, %	The ultimate tensile strength, MPa, in a day				
		1	3	7	28	720
Mineral white 60A	17,5	17,5	51,7	57,3	69,2	69,7
	5,2	5,2	38,6	53,3	70,5	82,2
	16,2	16,2	40,5	64,3	68,1	76,7
Mineral white 50A	10,5	10,5	22,0	32,1	74,1	70,5*
	12,6	12,6	41,5	50,7	62,2	56,5
	20,5	20,5	55,5	58,5	69,8	70,7
	8,0	8,0	34,1	53,7	66,5	72,2*

*- small surface friction chain

Optimum additives are siren 60A and 50A with raised by plaster content. Increase in amount of additive up to 15% reduces durability of samples owing to considerable linear lengthening in early terms of solidification and leads to emergence of a tretion on a surface of samples in later terms. Alignment of strength characteristics of samples happens to additive of spyok and plaster by 7-28 days of solidification.

Two years later, the strength of almost all samples with the addition of phosphogypsum-lime sinter is higher than the strength of the sample with the addition of gypsum. The increase in strength in this case is 10-22%.

Influence of a look and quantity of a phosphite - limy spyok on physicomechanical characteristics of the straining cement on the basis of a phosphite - limy spyok on the portlandtsement was studied on samples from cement mortar of structure 1:1 with standard Volsk sand at long free storage.

For example, the determination of the free linear expansion of samples from a tensile cement obtained by introducing 60A and 50A phosphogypsum-lime sinter into alite Portland cement showed that the samples containing 10% sinter of 50A have a maximum free linear expansion at the age of

208 days. With the introduction of a sinter of composition 60A in the same amount, the expansion value is almost and 3 times less, this is explained by the reduced content of free calcium oxide in sinter 60A in comparison with the sinter of composition 50A. An increase in the amount of tensile additive leads to an increase in free linear expansion. A free sample does not have significant linear expansion. Stabilization of expansion occurs mainly by 28 days of hardening. [8]

The ongoing process of hydration of Portland cement after stabilization of linear expansion by 28 days leads to the restoration of impaired strength of the samples. At the age of one year, almost all samples with the addition of phosphogypsum-calcareous sinter exceed the bending strength of the non-additive sample, which after 90 days hardening begins to decrease. [3]

Durability on compression of samples with the straining additives are also aligned after stabilization of process of bezdobaochny obrayets and in case of introduction of a spek of structure 60A in number of 7.5% even exceeds it. Is optimum on achievement of required effect structures with the maintenance of a phosphite - limy spek 60A,50A in number of 7.5%.

The introduction of phosphogypsum-calcareous cakes into portlancement makes it possible to obtain a tensile cement with a stable linear expansion of 0.2-0.5% and a self-tension of 1.8-2.7MPa.

References

1. Атакузиев ТА, Джандуллаева МС, Бекмурaратова МГ, Лутфуллаева НБ. Силикатный кирпич улучшенного качества с использованием твердых отходов содового производства. Materials of the IV international scitntific conference February 25-26. 2016 Pragua, 2016.
2. Бекмуратова МГ, Рахматова НШ, Атакузиев ТА. Твердения цементов в процессы схватывания с фосфогипсом и золо-шлаками, дополнительной добавкой глиёжа “Интернаука” Москва, 2019.
3. Бекмуратова МГ, Атакузиев ТФ, Шомансуров ФФ. Свойства быстротвердеющего цемента из легированного клинкера. Республиканская научно-техническая конференция 20-21 ноября, 2019
4. Атакузиев ТА, Джандуллаева МС. Физико механические свойства силикатных материалов на основе твердых содового производства. Химическая промышленность Санк-Петербург, 2017, 94.
5. Мещеряков ЮГ, Федоров СВ. Проблемы промышленной переработки фосфогипса в РФ состояние и переспективы // Фундаментальные исследования. 2015; 6-2:273-276.
6. Мещаряков ЮГ. –Промышленная переработка фосфогипса Ю.Г.Мещаряков, С.В.Федотов Санк-Петербург: Стройиздат СПб, 2007, 375с.
7. Атакузиев ТА, Турсунова ГР. Твердые отходов содового производства (ТОСП) как интенсификаторы обжига потртландцементного клинкера. Фундаментальные и прикладные научные исследования актуальные вопросы, достижения и инновации Пенза, 30 июля 2019 XXV Международной научно-практической конференции, 2019.
8. Джандуллаева МС, Атакузиев ТА. Отходы литейного производства для изготовления силикатных кирпичей с повышенноя сцепляемостью с кладочным раствором // Химическая технология. Т. 2015; 6:6-12.