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Composite Cement With the Use of Industrial Waste of Different Productions

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ABSTRACT: Today, active mineral additives of natural or technogenic origin are widely used in the production of cements in the world. Among them, new composite binders are actively used with the replacement of part of the clinker with mineral additives, which can significantly reduce the energy consumption of the production of hydration hardening building materials. For this reason, a number of studies are simple in technological application and relatively cheap methods aimed at increasing the efficiency of composite binders and concretes based on them.

KEY WORDS: hydraulic additive, portland cement, clinker, tuffite, tuffite fired at 600º, ash and slag, metallurgical slag of Bekabod, composite cement.

I. INTRODUCTION

At present, in the cement industry, it is extremely important to increase the economic efficiency of production and obtain spomal cements. For this, there are several possible solutions, you can reduce the cost of the resulting products by offsetting the use of new technologies or waste from various industries, or improve the quality of products with a minimum amount of costs [1,2]. One of the possibilities for obtaining building materials with certain strength and cost, and different characteristics are composite portland cements [3].
Particularly expanding and stressed cements are more common in practice. However, their use is uneconomical due to the scarcity and high cost of the constituent components.
These cements are not produced in the Republic of Uzbekistan.
The method of manufacturing expanding and nesting cement consists in joint or separate grinding of the constituent components followed by mixing .

Table 1 - Results of chemical analysis of additives

Additive name	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	П.п.п.
1.Tuffite	49,47	13,76	4,90	13,53	2,94	2,17	14,40
2.Tuffite burnt at 600º	49,47	13,76	4,90	13,53	2,94	2,17	14,40
3.ZShS	49,60	16,92	4,78	16,64	1,40	1,70	9,25
4. Slag	30,70	10,04	13,94	20,80	10,74	2,98	9,92

According to composite portland cement, it is regulated by GOST 31108-2003. Composite cement is a hydraulic binder obtained by joint grinding of portland cement clinker, gypsum stone and a composite additive consisting of two or more mineral components. Such cement as a composite additive may contain a mixture of metallurgical slag, fly ash or pozzolana (10 - 30%).
Plants can receive a wet ash-and-slag mixture, dry, dose and grind with clinker according to the existing technology, using tuffite fired at 600^0Cand grinding cement.

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Compositions of composite cement with various contents of ash-and-slag mixture, tuffite and Bekabod metallurgical slag were selected. Bekabad Portland cement was selected as a control composition, containing 20% of roasted tuffite, slag, metallurgical slag 10%, ash and slag 10%, gypsum 5%. The dispersion of the cements was equal to 350 m2 / kg.
It was found that an increase in metallurgical slag in the composition of cement worsens the grindability of the composite cement. At the same time, the specific surface of the obtained cements practically does not change with an increase in the tuffite of the ash-and-slag mixture.

II. RESULTS OF DETERMINATION OF PHYSICIST - MECHANICAL TESTS OF COMPOSITE CEMENTS.

Table-1

№ of formulations	Cement compositions%					Ultimate strength, 28 days MPa
	Clinker	ZShS	Tuffite	Slag	gypsum	
1	70	6	10	10	4	49
2	70	10	10	6	4	42
3	65	6	15	10	4	54
4	60	6	20	10	4	48

The results of determining the physicist - the mechanical properties of cements are shown in Table 2.
Increase in the amount of composite additive in the cement composition from 30 to 40%, water demand and setting time practically do not change, but for all compositions they meet the requirements of the standard.
The introduction of a composite additive in an amount of 30 - 40% leads to an increase in the compressive strength of cement stone at normal hardening compared to Portland cement with the addition of tuffite there.
Thus, for the production of composite cement, the following composition, 60% of clinker, can be recommended. , 20% tuffite, 10% slag, 6% ZSHT, 4% gypsum.
When choosing starting materials and developing cement compositions, we proceeded from the conditions of non-scarcity of raw materials and unlimited reserves, which predetermined the possibility of organizing industrial production of composite cements on its basis. The preparation of composite cements was carried out in a laboratory mill by joint grinding of the components to a degree of grinding with a sieve residue of 8 - 10%.
The results of physicist - mechanical tests made it possible to determine the optimal compositions of cements based on the indicated industrial waste, characterized by good kinetics of strength growth at compression. So the introduction of a complex additive accelerates the process of hydration of diluted cements in a 28 - day objection.
The developed cements based on industrial waste have shown that replacing Portland cement grade 400 with composite cements will save a large amount of Portland cement, improve the quality and strength of diligent materials.
The implementation of this project will significantly expand the range of building materials.
As a promising technology, which in the future can ensure the processing of a significant amount of waste, turning it into building materials.

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