БЕТОНИ ТРАНСПОРТНОГО ПРИЗНАЧЕННЯ НА ШЛАКОВМІСНИХ ЦЕМЕНТАХ

CONCRETE FOR TRANSPORT PURPOSES ON SLAG-CONTAINING CEMENTS

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It is known that blast furnace granulated slag has a complex of physical and chemical properties. It is one of the main mineral additives used in the production of cement. The chemical composition of slag is dominated by such oxides as: CaO, MgO, SiO_2 and Al_2O_3, which account for 90...95% of the slag mass. Depending on the speed and method of cooling the slag melt, it is possible to obtain slag with a different content of the glass phase, the share of which is usually up to 80%.

This combination of slag properties makes it possible to use slag-containing cements, for example, CEM II, CEM III, CEM V, for the production of special types of concrete. Concretes based on such cements must have high density, water resistance, gas resistance, and high deformability. They are able to gain strength during the entire hardening period and constantly improve their characteristics. Such concretes include concretes for the construction of roads and runway, hydro technical concretes, and concretes for underwater construction.

However, there are problems with the use of slag-containing cements, primarily slag-portland cements, for the production of ready-mix concrete, which are operated under the influence of aggressive environments. The main problems are the slow set of strength and other indicators of the quality of heavy concrete, as well as the low frost resistance of concrete on cements containing an increased amount of slag, compared to cements without slag. Until now, there is no consensus on the reasons for the decrease in concrete performance on slag-containing cements. However, based on the analysis of literature data, it can be assumed that this is due to the porosity of the concrete structure, first of all, the structure of the hardened cement dough and the structure of the cement mortar. In addition, the cause may be a rather slow process of hydrolysis of slag minerals and, accordingly, delayed colloidal-chemical reactions of the subsequent hydration and crystallization of newly formed silicates.

Therefore, the urgent task of using such cements for the production of ready-mix concrete is the task of improving properties of the slag component of cement.

One of the ways to implement this task is a complex effect on several levels of the concrete structure. As elements of impact, the most likely use of modern superplasticizers, possessing a complex action. Their influence extends both to the sub-microstructure of concrete (hydrosilicate gel), and to the microstructure

(hardening cement paste) and mesostructure (cement mortar). The use of a superplasticizer will allow you to activate cement by increasing the degree of its hydration. With the correct choice of such a complex action additive, the components included in the plasticizer should activate the colloidal-chemical processes of the interaction of slag minerals in the aqueous medium. In this way, the activation of the hydraulic component of slag-containing cement can be realized. This will increase the rate of cement hardening and increase the density of the concrete microstructure.

The most effective method of influencing the microstructure and mesostructure of concrete is the introduction of a microfiller into the concrete mix. The purpose of this is to increase the amount of reagents for the pozzolanic reaction. This will also make it possible to influence the kinetics of concrete hardening and ensure a constant and long-lasting set of strength over time. In addition, microfiller particles that did not enter the pozzolanic reaction will fill the pores and voids at these levels of the structure.

Thus, the use of multi-level physical and chemical activation together with the compaction of the concrete structure will increase the effectiveness of the use of slag-containing cements in concrete for transport purposes. The noted possibilities of such cements allow them to be classified as special-purpose cements.