RESEARCH OF MODERN METHODS OF PROTECTION OF REINFORCED CONCRETE STRUCTURES FROM CORROSION

N. Saidova

Teacher, Samarkand State architectural and Civil Engineering Institute. Samarkand, Uzbekistan

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ABSTRACT

This scientific article discusses the issue of the durability of concrete and reinforced concrete structures. The article describes the ways of using a basalt complex chemical additive (BKCD) as an increase in the corrosion resistance of road concretes that are operated in urban conditions.

Keywords: reinforced concrete structures, aggressive environment, alkali, chemical additive, mineral additives, basalt fiber concrete.

The durability of concrete and reinforced concrete structures is considered in the world as an element of sustainable development of structural concrete, contributing to the environmental friendliness of its production. Concrete corrosion resistance is an important part of this problem. In our article, we will consider some aspects of the problem - obtaining concrete with high corrosion resistance. We investigate the types of corrosion effects on concrete and reinforced concrete and methods of increasing corrosion resistance [5].

This issue is an industrial necessity for modern builders and engineers. Since concrete and reinforced concrete products are often affected by aggressive environment. In this regard, scientists and engineers of the world are looking for cheap and decent ways to protect concrete from corrosion using local minerals available in nature.

Concrete has long been widely used in the construction of various buildings and structures. The widespread use of concrete in construction is due to the great opportunities that this material provides to the builder. Using various cements and setting the value of the water-cement ratio, it is possible to obtain the desired concrete strength within a wide range; by the appropriate choice of aggregates and their composition, a change in its average density (bulk density) is achieved. By selecting cements, aggregates, chemical and mineral additives, it is possible to obtain concretes of various resistance and durability in any operating conditions, including the effect of aggressive media.

By the degree of impact on building structures, environments are divided into non-aggressive, slightly aggressive, moderately aggressive, highly aggressive.

By their physical state, the media are divided into gaseous, solid and liquid.

When designing concrete and reinforced concrete structures intended for operation in an aggressive environment, their corrosion resistance should be ensured by using primary protection measures: reducing the permeability of concrete technological methods, the use of corrosion-resistant materials, additives,
increasing the corrosion resistance of concrete and its protective capacity in relation to steel reinforcement, establishing requirements for the categories of crack resistance, the width of the design crack opening, the thickness of the protective layer of concrete.

Aggressive environments affecting concrete and reinforced concrete structures are classified according to a number of characteristics:

- the degree of aggressive impact on concrete and reinforced concrete: non-aggressive, weak, medium, highly aggressive;

- physical state: gas, liquid, solid;

- chemical composition: organic and inorganic, sulfates, chlorides, acids, magnesia salts, alkalis, salts that crystallize with a large increase in volume;

- biologically active, metabolic products of bacteria, fungi, fungal hyphae, plant roots. In addition, in specific operating conditions, certain physical processes can have a damaging effect on concrete: temperature (low and high temperatures in the range from minus 70 ° C to plus 50 ° C), freezing and thawing, moistening and drying [5].

Primary protection measures for concrete and reinforced concrete structures include:

1) the use of materials with increased corrosion resistance;

2) the use of additives that increase the corrosion resistance of concrete;

3) increasing the water resistance of concrete;

4) lowering the total porosity of concrete;

5) the establishment of special requirements for the design of concrete and reinforced concrete structures (increasing the massiveness of structures, increasing the thickness of the concrete cover of the reinforcement, reducing the estimated width of crack opening) [6].

This article describes how to use a basalt-complex chemical additive (BKCD) as an increase in the corrosion resistance of road concretes that are used in urban conditions. In addition to corrosion resistance, this BKCD, as a filler for binders, also increases the chemical, atmospheric, temperature and light resistance of concrete products and structures. This not only results in savings in energy consumption, but this technology does not require large financial performance (1).

The table shows the results of testing some modifiers of hardening accelerators with BKCD additives for conventional heavy concretes in the construction of urban concrete roadways.

Tests have established that all used mineral additives, regardless of the chemical composition, come into chemical interaction with solutions that mimic the environment of hardening concrete on Portland cement.

No. of Tawau	Additives	BM	BM	RSJ. MPa h / W day	RSJ. MPa h / W day	RSJ. MPa h / W 28- day	RSJ. MPa h / W 28-day
1.	Without additives	-	0.4	16.9	4.3	37.0	7.5
2.	Without additives	-	0.4	13.0	5.1	35.0	8.8
3.	The hardening accelerator (RSTN)	-	0.4	19.4	6.6	30.8	10.6

4.	Emblem 8-100	-	0.4	16.6	6.0	37.3	12.0
5.	BKHD	-	0.4	25.0	6.7	44.2	22.0

Table 1
Physical and mechanical parameters of the tested concrete composition

According to the indicators (the number of absorbed Cao, dissolved SiO2, related alkalis to changes in strength), minerals can be ranked:

- Brushless;
- Alkaline;
- Quartz;
- Basaltic:

It is clear from the results that the least persistent minerals are alkaline, and the most persistent are alkaline.

Research using basalt mineral was performed by many foreign organizations in the laboratory, such as the Institute of materials science of the Academy of Sciences of Ukraine, NIIZHB Russia, Central research Institute of industrial Sciences of Moscow, etc. (2).

Although the available data on the study of the corrosion resistance of basalt mineral in cement solutions are partial and contradictory, which in turn creates difficulties for the widespread use of cement-basalt composites in road construction.

Studying foreign research experiments in the field of fibroblast concrete, preparation is underway in mzhbk in Tashkent, work is underway to create cement composites using basalt mineral on the basis of laboratory studies.

Especially the use of basalt-complex chemical additives (BKHD) in road concrete, which are operated in aggressive open air, as well as under the influence of non-perevivnyh indicative friction of the concrete surface with the tires of the wheels of vehicles, which in turn require appropriate strength, makes it possible not only to save in materials, but also in the manufacture of a durable product from such concrete (3).In the course of experimental work, the following production issues were studied:

1. The effect of moving modes of mixtures and the sequence of introduction of components of the mixture, mixing water, heat and humidity treatment(MSW), the introduction of modifiers and accelerators of concrete hardening;

2. Influence of the percentage of BKHD on the physical and mechanical characteristics ;

3. Optimal solution for moving concrete mixes.

Based on the results of determining the physical and mechanical characteristics and the uniformity of the distribution of BKCD, two schemes for preparing basalt-fibrobeton were selected.

The results obtained confirm the possibility of obtaining high strength of the composite immediately after TVO, which makes it possible to accelerate their use in operation.

Also an important factor is the increased crack resistance that forms, due to the clogging of open areas in the concrete, components of BKHD.

The durability assessment is based on the method of A. A. Patsenko (4), which improved the numerical calculation for the rate of interaction of basalt mineral components with cement mortar components over time. This allows you to most reliably predict the durability of the composite up to 100 years.

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