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ON THE EFFECT OF METALLURGICAL WASTE-BASED COMPLEX MODIFICATORS ON THE PROPERTIES OF SQUARE CONCRETE

Doniyorov Nurmukhammad
MBI-1 group student Tashkent State Transport University
Nazarova Sarvinoz
MBI-2 group student Tashkent State Transport University
Choriyev Pulat
MBI-2 group student Tashkent State Transport University
Ganiyev Nurmukhammad
MBI-2 group student Tashkent State Transport University
Isakulov Navruz
MBI-2 group student Tashkent State Transport University
Nurmukhamedova Diyora
BI-37 group student Tashkent State Transport University

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Abstract:

This article describes the effects of mechanically activated microfillers based on multi-ton waste generated in the steel industry on the physical and mechanical properties of crushed concrete.

Keywords: Crushed concrete, polycarboxylate, mineral microfiller, metallurgical slag, strength, water absorption, corrosion resistance.

INTRODUCTION

The recent increase in the share of construction in the country is leading to an increase in demand for new modern building materials. Examples of such materials are fine-grained concrete. Demand for fine-grained concrete, which is characterized by high density, convenient location and homogeneity of the structure compared to coarse aggregate concrete, has been increasing in recent years.[1-4]

Fine concrete is widely used due to its unique properties. Reinforced concrete, and on their basis it is used in the construction of thin-walled barriers, foundations, road slabs, curbs and monolithic buildings. However, the increasing requirements for the quality of fine-grained concrete require the solution of the problem of improving the construction-operational, technological and strength properties of this type of composites. Therefore, the production and production of new types of complex-modified fine-grained concrete with high physical-mechanical and low cement consumption with the use of mineral microfillers and plasticizers is a topical issue. A promising way to target the properties of aerated concrete and the use of new generation polycarboxylate superplasticizers and silica-containing microfillers based on nanotechnologies.[4-5]

This article presents an analysis of the physical and mechanical properties of crushed concrete modified with polycarboxylate super plasticizer and microfiller based on steel industry waste.[6-9]

The practical significance of the research is the addition of additives to the concrete, which is used in the construction process, increasing the physical and mechanical properties of the concrete, saving products and scope of application, polycarboxylate superplasticizers and silicon-containing micro-organisms in appropriate amounts based on the structure of new compositions. It is characterized by the use of stimulants. In addition to the work that needs to be done at each stage of the process, the main goal is to achieve new results by selecting well-thought-out content. For the work, a fraction close to the grain of cement was prepared from a metallurgical waste containing a silicon element through a ball mill. Using these fractions, samples of 40x40x160 mm were prepared for two-component studies. (Table 1)

As a result of the experiments, a fraction with a surface area of S_{NS} = 2117 sm^2 / g was selected. The physicochemical properties of the components under study, such as compressive strength, flexural strength, water absorption, frost resistance, corrosion resistance, and density, were studied during 3, 7, 14, and 28-day solidification. In the next stage, the optimal proportion of our fraction, which further improved the properties of cement, was determined by increasing the proportion of the amount in the mixture. According to the results, the composition of the cement mixture with 15% metallurgical waste MCh was found to be the most alternative in terms of its properties.

At the main stage, based on the above experiments, the properties of complex-modified fine-grained concrete (MMB) were filled with 15% of cement with a surface area of metallurgical waste S_{NS} = 2117sm2 / g.

Table 1
Content used in the experiment

	Cement, g	Sand, g	Water, g	Mineral additive (MCh), g	Sp, %
Etalon	500	1350	200	-	-
Complex-modified content	425	1350	170	75	1

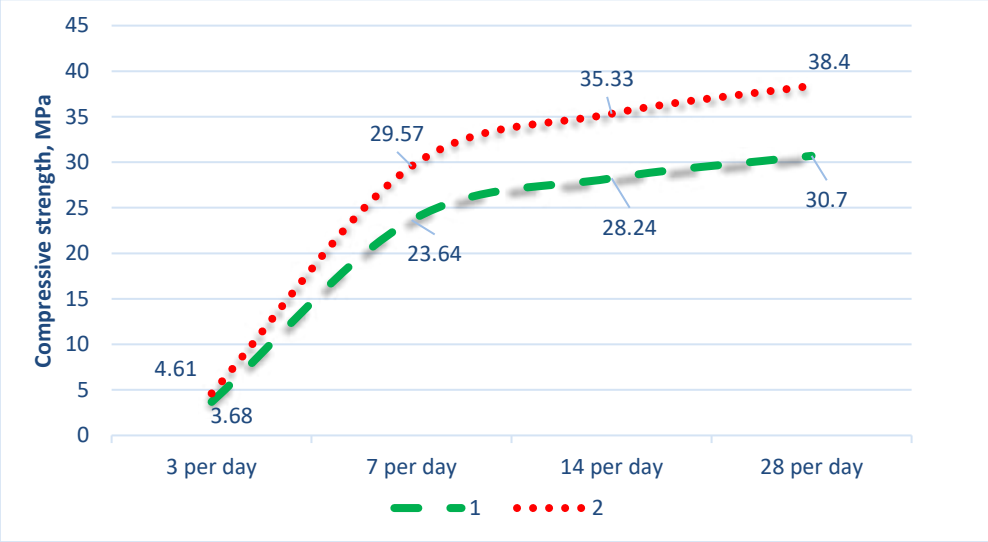

Figure 1. Compressive strength of standard (1) and complex-modified (2) components

When we studied the compressive strength of micropowered concrete (standard) with samples containing complex-modifier (KM), after 28 days (normal conditions) the results showed that the sample (KM) showed a strength of 20%. was found to be high on the index.

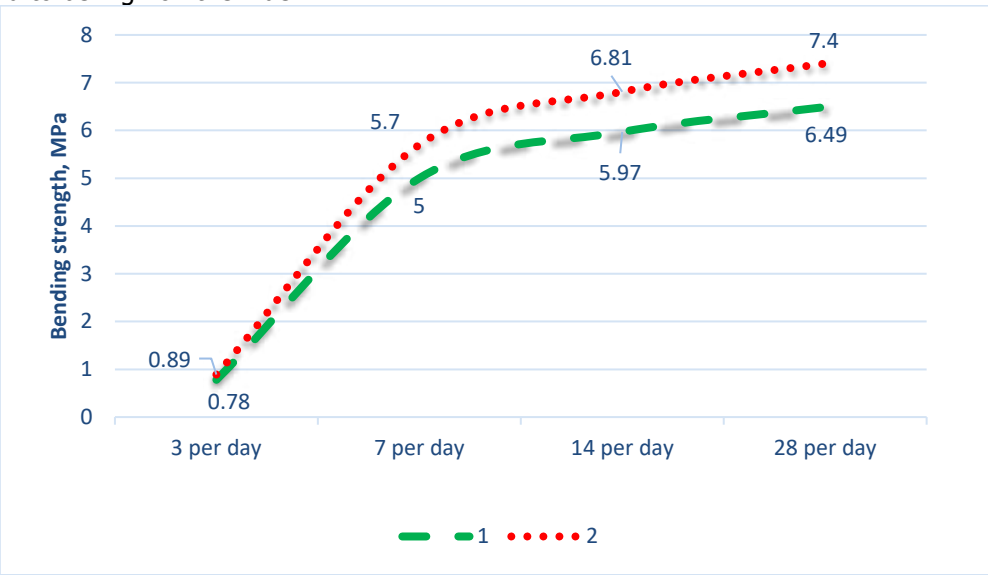

Figure 2. Bending strength of standard (1) and complex-modified (2) components

When we studied the bending strength of micropowered concrete (standard) and (KM) relative to the standard with samples, the results obtained after 28 days (normal conditions) (KM) showed that the strength was higher by 12.3%.

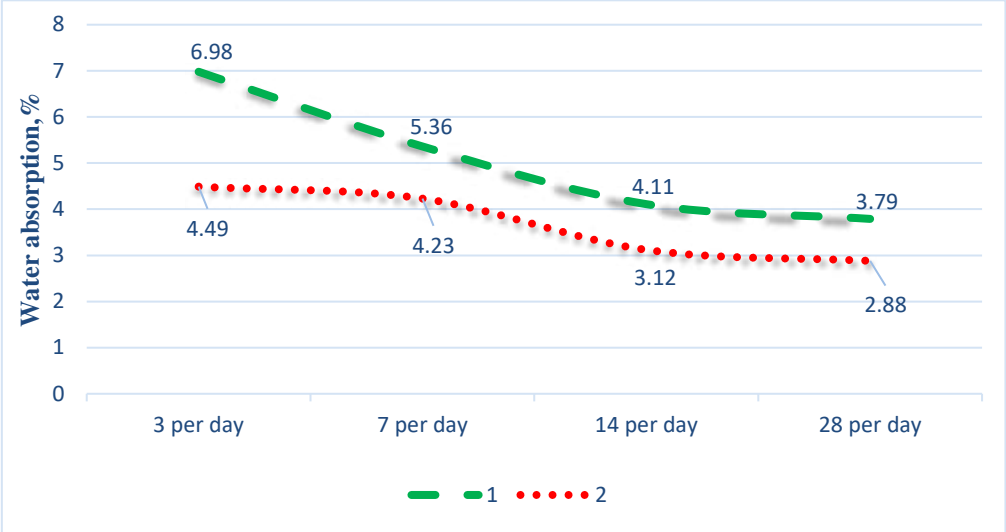

Figure 3. Water absorption of standard (1) and complex-modified (2) compositions

The composition (standard) of microwave aggregate concrete and (KM) proved to be low in terms of saturation rate of 24.01% for 28 days. The water absorption of the samples is 24% less compared to the reference content. Also in our study, the physical and mechanical parameters of ordinary and (KM) composite concrete in terms of frost resistance, corrosion resistance, density are given in Table 2.

Table 2
Physical and mechanical properties of reference and complex-modified modifiers

№	Frost resistance, period	Frost resistance, g / sm^2	Density, kg / m^3
Etalon	250	0,648	2,148
Complex-modified content	300	0,589	2,121

Our above experiments show that modification of micropowered aerated concrete by means of complex fine-dispersed additives and plasticizers can increase freezing, increase corrosion resistance, reduce density and improve the properties of concrete by an average of 10-15%, improve the quality of cement raw materials. With a reduction of 15%, it is possible to use metallurgical waste as a useful raw material.

CONCLUSION.

The results of the experiments show the following:

• The compressive strength of the complex-modifier (KM) component increased by 20% compared to the reference composition, while the bending strength limit increased by 12.3%:

• Based on the results of the water absorption, it can be said that the water saturation of the sample decreased by 24% compared to the standard due to the reduction of the porosity of the modifiers at different levels:

• Frost resistance led to an increase of 1 point in the complex-modified composition, a decrease in corrosion resistance by 10.01%, and a decrease in density of 2,121 kg / m3.

In general, the use of complex modifiers to reduce cement consumption by 15% leads to an increase in the physical and mechanical properties of the modified composition and a 5-7% reduction in energy consumption in the production of this type of composites

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