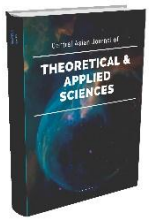


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# On the Effect of Physical and Mechanical Properties of Fibrobeton Based on Metallurgical Waste


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***Annotation:*** *The article presents the results of physico-mechanical performance of waste-based, mechanically activated microfiller and polycarboxylate superplasticizer and fibrous concrete of basalt fibers generated in the metallurgical industry.*



***Keywords:*** *fiber concrete, polycarboxylate, modifier, mineral microfiller, metallurgical slag, basalt fiber.*


**Introduction.** Increasing the efficiency of modern construction and production, reducing the cost and labor costs of construction materials, efficient use of energy resources and the application of new advanced technologies are increasing. Concrete is widely used today as the most popular material due to its technological, low cost, the ability to implement any architectural idea from this material and the sufficient abundance of raw materials. Concrete is a material with this granular structure. This type of material is characterized by very good performance in compression. However, while the strength of such structural materials to bending and elongation remains, the impact resistance is 15 ... 20 times lower than that of compression. In order to overcome such shortcomings and to improve the above-mentioned properties, fiber-based (fibra) disperse bonding is used.

The first fibrous concrete structure in the world was used in 1909 by Russian scientist VP Nekrasov. Research on the production of fiber concrete and methods of calculating structures from them has been widely developed since the 60s of the 20th century. The first large-scale practical use of fibrous reinforced concrete in the twentieth century dates back to 1976, when it was used to build a runway at airfields. But one of the main reasons why this material has not been widely used to date was that it has not been sufficiently studied.

Fibroconcrete has many advantages:

- reduces construction costs by using fibers instead of reinforcing mesh and carcasses;
- reduces the shrinkage of concrete (usadka);
- fiber concrete has a longer service life than other types of concrete;

To date, polypropylene, carbon, glass, steel fiber, as well as basalt fiber fiber concrete are widely used. It should be noted that as the prospects for the use of fiber concrete are expanding, the demand for its physical and mechanical properties is growing. This paper examines the effects of complex additives based on metallurgical waste and polycarboxylate superplasticizers, as well as basalt fibers of different sizes on the properties of fibrobeton.

**Materials and research methods used in the experiment.** PTs400 D0 Portland cement produced by "OHANGARONSEMENT" OAJ was used in the experiments. Maysky quarry quartz sand with a modulus of magnitude $M_k$ = 1.9 and metallurgical wastes generated at the Mechanical Casting Plant of JSC Uzbekistan Railways and crushed to a relative surface of Sud = 2200 $cm^2$ / g were used as fine aggregates. Polycarboxylate superplasticizer was used as a chemical additive and was added in an amount of 1% of the cement mass. The results selected for the experiment are presented in Table 1.

**Table 1 Ingredients used in the experiment**

| NAMING | Cement, g | Sand, g | Water, g | Total | BTF, g (5mm) | BTF, g (10mm) | Mineral supplement, g | SP,% |
|---|---|---|---|---|---|---|---|---|
| Contents №1 | 500 | 1500 | 200 | 2200 | 44 | - | 75 | 1 |
| Contents №2 | 500 | 1500 | 200 | 2200 | 88 | - | 75 | 1 |
| Contents №3 | 500 | 1500 | 200 | 2200 | 132 | - | 75 | 1 |
| Contents №4 | 500 | 1500 | 200 | 2200 | - | 44 | 75 | 1 |
| Contents №5 | 500 | 1500 | 200 | 2200 | - | 88 | 75 | 1 |
| Contents №6 | 500 | 1500 | 200 | 2200 | - | 132 | 75 | 1 |
| Etalon | 500 | 1500 | 170 | 2170 | - | - | - | 1 |
| Steel fiber concrete | 500 | 1500 | 200 | 2200 | - | 44 | 75 | 1 |

In the experiments, prism samples of 40x40x160 mm were prepared and physico-mechanical parameters were determined at 3, 7, 14, and 28 days.

Figure 1 below shows the compressive strength of the tested components. According to him, the content at №5 with 41.4 MPa showed its high strength value among the remaining compositions.

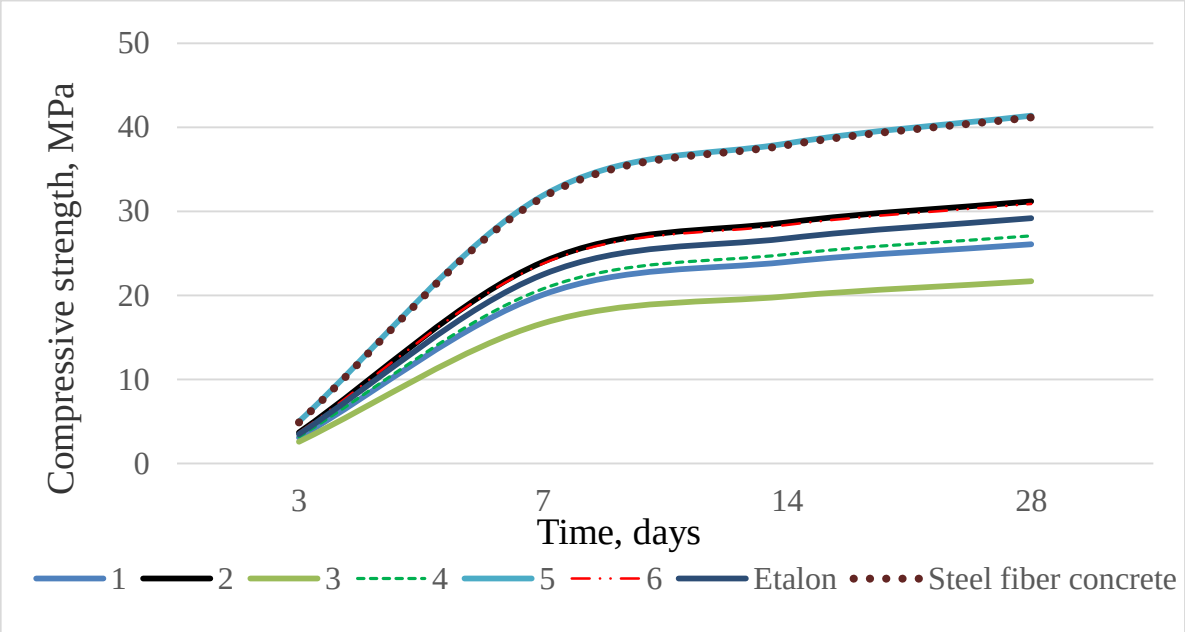

**Figure 1. The change in compressive strength of the studied components over time**

As can be seen from Figure 2, samples made of basalt fiber reinforced concrete showed an average strength increase of 8-30% in sample №1…, sample №6, sample №5-30%, and 25% in metal fiber fibrobeton. . The highest strength index was observed in the sample-№5 with the amount of basalt fibers 4%, size 10mm.

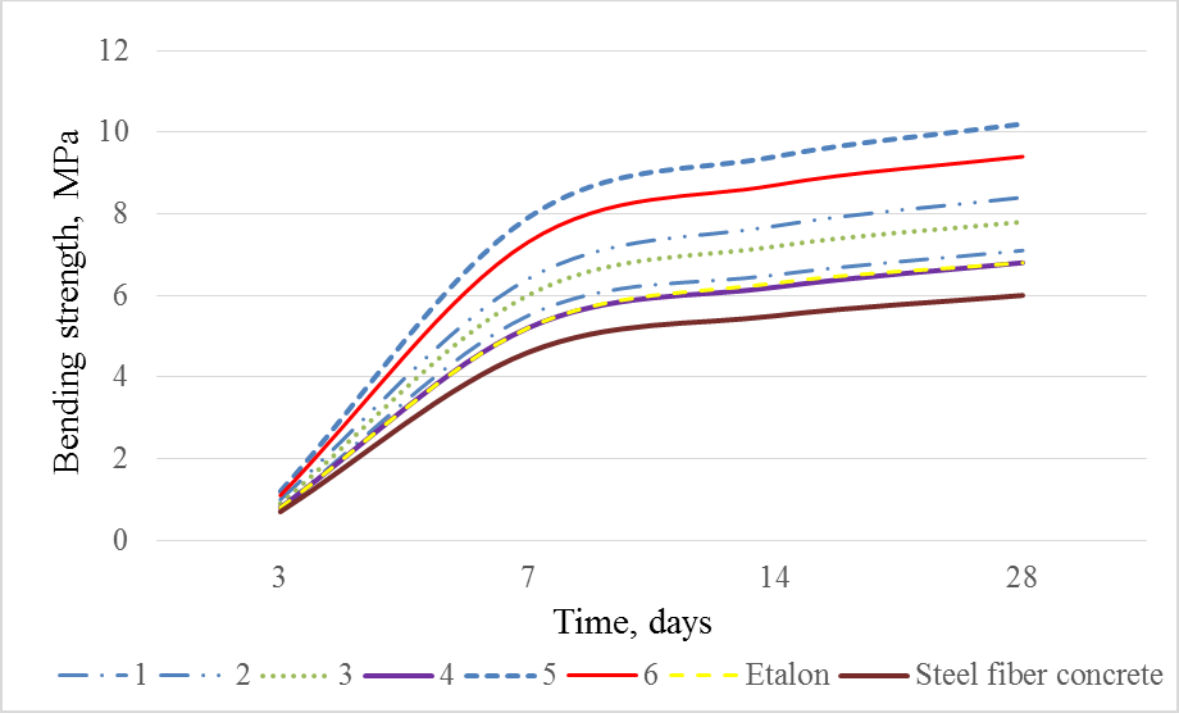


**Figure 2. Variation of the bending strength of the studied components over time**

In our experiment, a high result was obtained in terms of bending strength in a sample №5 with a size of 4% and a size of 10 mm of basalt fibers. The physical and mechanical properties of the studied components are given in Table 2.

**Table 2 Physical and mechanical properties of the studied components**

| NAMING | Frost resistance, g / $m^2$ | Frost resistance, cycle | Density, kg / $m^3$ | Water permeability,% |
|---|---|---|---|---|
| Contents №1 | 0.632 | 200 | 2051 | 4.5 |
| Contents №2 | 0.58 | 200 | 2070 | 4.5 |
| Contents №3 | 0.721 | 150 | 1953 | 7.4 |
| Contents №4 | 0.621 | 200 | 1999 | 4.8 |
| Contents №5 | 0.51 | 300 | 2098 | 3.7 |
| Contents №6 | 0.58 | 200 | 1992 | 4.67 |
| Etalon | 0.62 | 150 | 2011 | 9.2 |
| Steel fiber concrete | 0.512 | 250 | 2148 | 8.33 |

The analysis of the results showed that the strength of the corrosion resistance was 17% higher at tarkib5 than the standard content, the frost resistance was class 2, and the water repellency index was-60% higher.

## Conclusion

Based on the experiments, the following can be concluded:

- Our above experiments show that microfiller fibro concrete allows to improve the properties of concrete by an average of 10-15% through the use of complex fine-dispersed additives and plasticizers and the efficient use of metallurgical waste.
- The use of complex modifiers allows the production of high quality composites with improved physical and mechanical properties.

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