

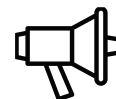
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PROPERTIES OF HEAVY CONCRETE DISPERSEDLY REINFORCED WITH NON- METALLIC FIBERS AND SPECIFIC FEATURES OF CALCULATING CONCRETE STRUCTURES BASED ON THEM

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Abstract. This article investigates the physical and mechanical properties of heavy concrete reinforced with non-metallic dispersed fibers, as well as the specific features involved in calculating concrete structures based on such materials. The study analyzes the influence of various types of non-metallic fibers, including polymer, basalt, and glass fibers, on the strength characteristics, crack resistance, and deformation properties of concrete. In addition, the behavior of fiber-reinforced concrete under loading conditions is substantiated through both experimental and theoretical approaches.

The paper also highlights the factors that should be considered in the design and calculation of such concrete structures, which differ from conventional calculation methods. These factors include the volume fraction of fibers, their interaction with the concrete matrix, and the characteristics of stress distribution within the material. The obtained results possess both scientific and practical significance for the effective application of non-metallic fibers in concrete and for improving the durability and reliability of building structures.

Key words: non-metallic fibers, dispersed reinforcement, fiber-reinforced concrete, heavy concrete, basalt fiber, crack resistance, calculation methodology, flexural strength.

Annotatsiya. Ushbu maqolada nometall tolalar bilan dispers armaturalangan og'ir betonlarning fizik-mexanik xususiyatlari hamda ular asosida tayyorlangan beton konstruksiyalarni hisoblashning o'ziga xos jihatlari tadqiq etilgan. Tadqiqot davomida polimer, bazalt va shisha tolalar kabi turli xil nometall tolalarning betonning mustahkamlik ko'rsatkichlari, yoriqqa chidamliligi va deformatsion xususiyatlariga ta'siri tahlil qilindi. Shuningdek, tolali betonlarning yuklama ostidagi ishlash mexanizmlari eksperimental va nazariy yondashuvlar asosida asoslab berildi.

Maqolada bunday beton konstruksiyalarni hisoblashda an'anaviy usullardan farq qiluvchi omillar, jumladan tolalarning hajmiy ulushi, ularning beton matritsasi bilan o'zaro ta'siri hamda kuchlanishlarning taqsimlanish xususiyatlari yoritilgan. Olingan natijalar beton tarkibida nometall tolalardan samarali foydalanish va qurilish konstruksiyalarining ishonchligi hamda uzoq muddat xizmat qilishini oshirish nuqtai nazaridan ilmiy-amaliy ahamiyatga ega.

Kalit so'zlar: nometall tolalar, dispers armaturalash, fibrobeton, og'ir beton, bazalt tolasi, yoriqqa chidamlilik, hisoblash metodikasi, egilishdagi mustahkamlik.

Аннотация. В данной статье исследуются физико-механические свойства тяжёлых бетонов, дисперсно армированных неметаллическими волокнами, а также особенности расчёта бетонных конструкций на их основе. В ходе исследования проанализировано влияние различных видов неметаллических волокон, включая полимерные, базальтовые и стеклянные волокна, на прочностные характеристики, трещиностойкость и деформационные свойства бетона. Кроме того, на основе экспериментальных и теоретических исследований обоснованы механизмы работы фибробетонов и особенности их поведения под нагрузкой.

В статье освещаются факторы, которые необходимо учитывать при расчёте конструкций из таких бетонов и которые отличаются от традиционных методов расчёта. К ним относятся объёмная доля волокон, особенности их взаимодействия с бетонной матрицей, а также характер распределения напряжений внутри материала. Полученные результаты имеют научно-практическое значение для эффективного применения неметаллических волокон в бетоне и повышения надёжности и долговечности строительных конструкций.

Ключевые слова: неметаллические волокна, дисперсное армирование, фибробетон, тяжёлый бетон, базальтовое волокно, трещиностойкость, методика расчёта, прочность при изгибе.

INTRODUCTION

At present, the application of modern materials in the construction industry, as well as ensuring the reliability and durability of building structures, is considered one of the most important and relevant issues. Although conventional heavyweight concrete possesses high compressive strength, its relatively low tensile strength, susceptibility to cracking, and brittle failure behavior considerably limit its range of application. Therefore, significant scientific research is being conducted to improve the physical and mechanical properties of concrete and enhance its overall performance characteristics.

In recent years, the method of improving concrete properties through the incorporation of various types of fibers — commonly referred to as fiber reinforcement or dispersed reinforcement — has been widely adopted in construction practice. In particular, non-metallic fibers, such as polymer, basalt, and glass fibers, have proven to be effective in increasing crack resistance, improving deformation behavior, and enhancing the impact resistance of concrete. Compared with metallic fibers, non-metallic fibers offer several important advantages, including corrosion resistance, lower weight, chemical stability, and economic efficiency.

At the same time, the mechanical behavior of concrete reinforced with non-metallic fibers differs significantly from that of conventional concrete. The presence of dispersed fibers changes the stress distribution within the material and influences the crack formation and failure mechanisms of concrete structures. Consequently, this creates the need for the development of new theoretical and practical approaches for the analysis and design of structures made from fiber-reinforced concrete.

Particular attention should be given to factors such as the volume fraction of fibers, their geometric characteristics, the interaction between fibers and the concrete matrix, and their influence on the stress–strain state of the material. In addition, the effective use of non-metallic fibers contributes not only to improving structural reliability but also to increasing the service life and sustainability of construction materials.

The aim of this paper is to investigate the main physical and mechanical properties of heavyweight concrete reinforced with non-metallic fibers and to identify the specific features involved in calculating and designing concrete structures based on such materials.

LITERATURE REVIEW

High-strength fiber-reinforced concrete can be achieved provided that several important conditions are satisfied. These include the presence of a sufficient amount of uniformly distributed high-strength fibers, reliable adhesion between the fibers and the concrete matrix, uniform dispersion of fibers throughout the matrix volume, chemical inertness of the matrix with respect to the fibers, a higher modulus of elasticity of the fibers compared to that of the concrete matrix, and the tendency of fibers to orient within the matrix structure [1-2].

From a structural engineering perspective, steel fiber reinforcement is considered one of the most effective types of dispersed reinforcement because the modulus of elasticity of steel fibers is approximately six times greater than that of conventional concrete. However, non-metallic fibers also demonstrate significant advantages in improving the performance of concrete composites.

Glass fibers with a diameter of 8–10 μm possess tensile strength comparable to that of high-carbon cold-drawn steel wire (1.8–2.5 GPa), while having a density approximately 3.5 times lower. Although the modulus of elasticity of glass fibers (70–80 GPa) is lower than that of steel fibers, it is nearly three times greater than the initial modulus of elasticity of concrete (approximately 30 GPa). This confirms the effectiveness of glass fibers as reinforcing elements in concrete structures.

Basalt fibers also exhibit high tensile strength ranging from 1.6 to 3.6 GPa, with values close to those of high-strength glass fibers. In addition, the modulus of elasticity of basalt fibers exceeds that of glass fibers by approximately 15–20%, which increases their effectiveness in dispersed reinforcement systems.

Synthetic polypropylene-based fibers are characterized by high deformability, with ultimate elongation

values ranging from 10% to 25%. However, their modulus of elasticity ($E = 3.5\text{--}8.0$ GPa) does not exceed 25% of the modulus of conventional concrete. Therefore, polypropylene fibers are generally not considered highly effective for structural reinforcement, although they may be successfully applied in local repair and rehabilitation works of load-bearing structures.

According to research findings [3], fibers used for concrete reinforcement can be classified into two categories: low-modulus fibers and high-modulus fibers. High-modulus fibers possess a modulus of elasticity greater than that of the matrix they reinforce, whereas low-modulus fibers exhibit a lower modulus. The application of low-modulus fibers mainly improves the impact resistance and toughness of concrete. In contrast, high-modulus fibers significantly enhance the tensile strength of concrete, increase the modulus of elasticity of the composite material, and improve resistance to dynamic and cyclic loading.

Studies [3] have also demonstrated that carbon fibers can effectively improve the physical and mechanical properties of concrete. These fibers possess high corrosion resistance and contribute to increasing both the tensile strength and the modulus of elasticity of the cement matrix.

The main physical and mechanical characteristics of fibers used for dispersed reinforcement of concrete are presented in Table 1 [3-5].

Table 1
Physical and mechanical characteristics of fibers for dispersed concrete reinforcement¹

Type of fibers	Density, kg/m ³	Tensile strength, GPa	Modulus of elasticity, GPa	Elongation at fracture, %
<i>Low-modulus fiber</i>				
Polypropylene	900	0,4–0,77	3,5–8	10–25
Polyethylene	950	0,7	1,4–4,2	10
Nylon	1100	0,77–0,84	4,2	16–20
Acrylic	1100	0,21–0,42	2,1	25–45
Polyester	1400	0,73–0,78	8,4	11–13
Cotton	1500	0,42–0,7	4,9	3–10
<i>High-modulus fiber</i>				
Carbon	2000	2,0	245	1
Asbeston	2600	0,91–3,1	68–70	0,6
Glass	2600	1,05–3,85	70–80	1,5–3,5
Basalt	2600	1,6–3,6	80–110	1,4–3,6
Steel	7800	0,80–3,15	200	3–4

1 Author's development

Figure 1. Polypropylene fiber²Figure 2. Carbon fiber³Figure 3. Glass fiber⁴Figure 4. Basalt fiber⁵Figure 5. Steel fibers⁶

RESEARCH METHODOLOGY

In this study, experimental investigations were conducted to determine the physical and mechanical properties of heavyweight concrete reinforced with non-metallic fibers, as well as to examine the behavior of structural concrete elements produced from such materials. For the experimental program, standard concrete specimens and reinforced concrete elements were prepared and tested under laboratory conditions.

Conventional heavyweight concrete consisting of Portland cement, natural sand, crushed stone, and water was used as the base material. For dispersed reinforcement, three types of non-metallic fibers were employed: polypropylene fibers, basalt fibers, and glass fibers. The fiber length varied from 6 mm to 24 mm, while the volumetric content of fibers in the concrete mixture ranged from 0.5% to 2.0%.

The experimental specimens included cubes measuring 100×100×100 mm, prisms measuring 100×100×400 mm, and beam specimens measuring 100×100×500 mm for flexural testing. All specimens were cured under standard laboratory conditions for 28 days to ensure proper hydration and strength development.

During the testing process, the compressive strength, tensile strength, flexural strength, and deformation characteristics of the concrete were determined. Compression testing machines were used to evaluate the strength properties of the specimens, while deformation parameters were recorded using appropriate measuring instruments. The initiation and propagation of cracks were examined through visual observations and optical

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measuring devices.

In addition, the deflection and deformation behavior of reinforced concrete elements under loading conditions were measured using dial gauges, and the corresponding stress–strain and load–deflection graphs were constructed. Special attention was given to the influence of different fiber types and fiber contents on crack resistance, ductility, and overall structural behavior of the concrete elements.

Based on the obtained experimental results, the influence of non-metallic fibers on the physical and mechanical properties of heavyweight concrete was evaluated, and the principal relationships describing the stress–strain behavior of fiber-reinforced concrete elements were established (Figure 6).

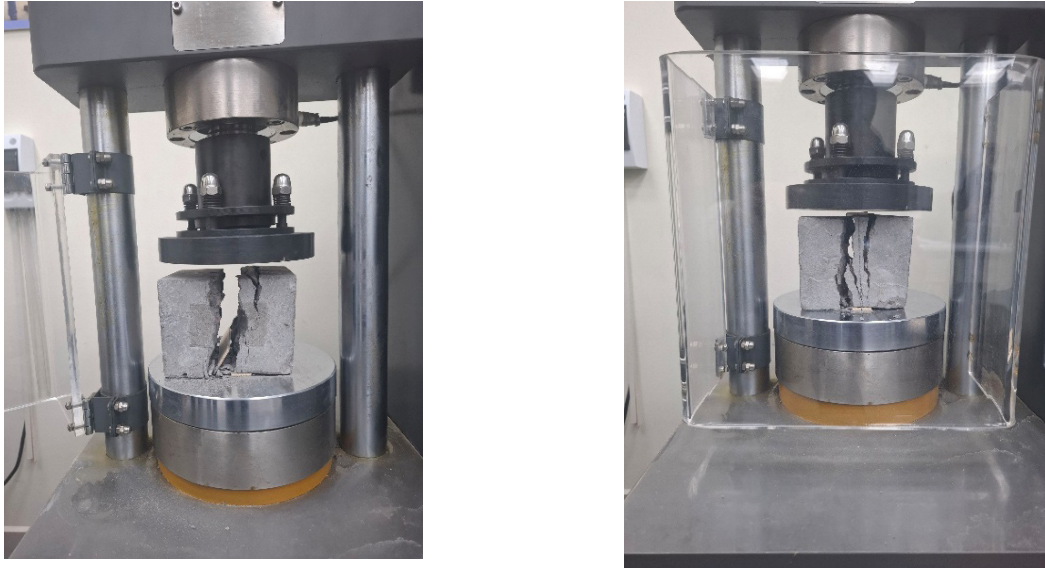


Figure 6. Compressive Strength of Fiber-Reinforced Concrete Specimens⁷

ANALYSIS AND RESULTS

The results of the experimental investigations demonstrate a significant influence of basalt fiber reinforcement (BFR) on the compressive strength and overall performance of heavyweight concrete across all investigated series.

For the first experimental series, with a cement content of 350 kg/m^3 , the compressive strength of the reference concrete without fibers was 25.2 MPa . The introduction of basalt fibers resulted in a gradual increase in strength, reaching a maximum value of 30.6 MPa at a fiber length of 20 mm and a fiber volume fraction of 1.0% . This corresponds to an increase of approximately 21.4% compared with the control composition. In addition, mixtures reinforced with fibers of $15\text{--}20 \text{ mm}$ length exhibited lower coefficients of variation ($3.21\text{--}4.32\%$), indicating improved uniformity, structural stability, and reliability of the concrete matrix.

In the second series, with a cement content of 425 kg/m^3 , the compressive strength of the plain concrete was 31.4 MPa . After the incorporation of basalt fibers, the strength characteristics improved considerably, with the maximum value of 37.4 MPa observed for concrete containing fibers 20 mm in length and 1.0% by volume. This represents an increase of approximately 19.1% . However, when the fiber content increased to 1.5% , a slight reduction in strength was observed in several cases. This phenomenon can be explained by decreased workability of the concrete mixture, difficulties in compaction, and non-uniform distribution of fibers within the cement matrix.

For the third experimental series, with a cement content of 530 kg/m^3 , the compressive strength of the reference concrete reached 37.5 MPa . The addition of basalt fibers produced the highest strength values among all tested mixtures, reaching up to 46.5 MPa at a fiber length of 20 mm and a fiber content of 1.0% . This corresponds to an increase of approximately 24% , demonstrating that dispersed reinforcement is particularly effective in high-strength concrete compositions. Furthermore, the relatively low coefficients of variation ($2.66\text{--}3.85\%$) confirm the stability and reliability of the obtained experimental results.

A common tendency observed throughout all experimental series is that the optimal fiber content is approximately 1.0% , regardless of fiber length. Increasing the fiber volume fraction to 1.5% did not produce proportional improvements in strength and, in some cases, negatively affected the mechanical properties of the

⁷ Author's development

concrete. This can be attributed to fiber agglomeration, reduced mobility of the concrete mixture, and difficulties in achieving homogeneous fiber dispersion throughout the matrix.

The influence of fiber length was also found to be significant. Fibers with a length of 20 mm provided the greatest improvement in compressive strength compared with shorter fibers of 10 mm and 15 mm. This effect can be explained by the higher crack-bridging capacity of longer fibers and their ability to redistribute internal stresses more effectively within the concrete structure.

In addition to improving strength characteristics, the reduction in the coefficients of variation for fiber-reinforced concrete mixtures indicates enhanced homogeneity and structural integrity of the material. Basalt fibers act as micro-reinforcing elements that restrain crack initiation and limit crack propagation, thereby improving the durability and reliability of the concrete.

Overall, the experimental results confirm that basalt fiber reinforcement is an effective method for enhancing the compressive strength, crack resistance, and structural reliability of heavyweight concrete. The optimal reinforcement parameters identified in this study are a fiber length of 20 mm and a fiber volume fraction of 1.0%, which ensure maximum reinforcement efficiency while maintaining acceptable workability of the concrete mixture [6].

The experimental data were processed using methods of mathematical statistics, and the obtained results are presented in Table 2.

Table 2

Strength of Basalt Fiber-Reinforced Concrete and Plain Heavyweight Concrete Specimens⁸

No	Concrete composition	Cement content, kg/m ³	Concrete type	R _m - average strength, MPa	S _m - standard deviation	
1	1- Series	350	Plain concrete	25,2	1,62	6,32
			BFRC (10 MM – 0,5%)	27,5	1,67	6,25
			BFRC (10 MM – 1,0%)	27,9	1,64	6,83
			BFRC (10 MM – 1,5%)	27,6	1,84	7,21
			BFRC (15 MM – 0,5%)	27,9	0,74	3,87
			BFRC (15 MM – 1,0%)	29,1	0,92	3,56
			BFRC (15 MM – 1,5%)	28,5	0,80	3,21
			BFRC (20 MM – 0,5%)	29,1	1,02	4,32
			BFRC (20 MM – 1,0%)	30,6	0,47	2,85
			BFRC (20 MM – 1,5%)	29,6	1,55	5,11

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2	2- Series	425	Plain concrete	31,4	2,03	6,24
			BFRC (10 MM – 0,5%)	35,9	1,91	5,45
			BFRC (10 MM – 1,0%)	33,8	1,72	5,37
			BFRC (10 MM – 1,5%)	34,3	1,07	3,54
			BFRC (15 MM – 0,5%)	34,9	0,78	2,88
			BFRC (15 MM – 1,0%)	35,7	1,34	4,35
			BFRC (15 MM – 1,5%)	31,5	1,15	4,91
			BFRC (20 MM – 0,5%)	34,5	1,60	5,22
			BFRC (20 MM – 1,0%)	37,4	0,68	2,54
			BFRC (20 MM – 1,5%)	36,7	1,73	5,93
3	3- Series	530	Plain concrete	37,5	1,55	4,74
			BFRC (10 MM – 0,5%)	41,4	1,51	0,04
			BFRC (10 MM – 1,0%)	42,0	0,74	2,63
			BFRC (10 MM – 1,5%)	41,1	1,70	4,71
			BFRC (15 MM – 0,5%)	39,9	1,60	4,36
			BFRC (15 MM – 1,0%)	43,5	1,70	3,13
			BFRC (15 MM – 1,5%)	43,0	1,09	3,89
			BFRC (20 MM – 0,5%)	46,0	0,98	2,66
			BFRC (20 MM – 1,0%)	46,5	1,19	3,85
			BFRC (20 MM – 1,5%)	44,3	0,87	2,69

CONCLUSION AND RECOMMENDATIONS

Based on the experimental investigation of heavyweight concrete reinforced with basalt fibers, several important conclusions can be drawn.

The incorporation of basalt fibers into the concrete matrix leads to a significant improvement in the compressive strength of heavyweight concrete across all investigated cement content levels (350, 425, and 530 kg/m³). Compared with conventional concrete, the increase in compressive strength ranged from approximately 9% to 24%, depending on the fiber length and volume fraction used in the mixture.

The highest efficiency of dispersed reinforcement was observed at a fiber length of 20 mm and a fiber volume fraction of 1.0%. Under these conditions, the maximum compressive strength values were achieved in all three experimental series, reaching 30.6 MPa, 37.4 MPa, and 46.5 MPa respectively. These results indicate that the identified parameters represent the optimal reinforcement configuration within the scope of the

conducted research.

The study also established that increasing the fiber content beyond 1.0% does not result in proportional growth of strength characteristics and, in some cases, may even reduce the mechanical performance of the concrete. This phenomenon is mainly associated with reduced workability of the concrete mixture, difficulties in compaction, and non-uniform distribution of fibers throughout the concrete matrix.

The obtained experimental results confirm that the effectiveness of basalt fiber reinforcement becomes more pronounced with increasing cement content and higher concrete strength levels. This demonstrates a more effective interaction between the dispersed fiber system and a denser cement matrix, ensuring improved stress transfer and crack-bridging mechanisms within the composite material.

Statistical analysis of the experimental data showed a reduction in the coefficient of variation for fiber-reinforced concrete mixtures compared with plain concrete. This indicates improved homogeneity, structural integrity, and stability of the material, confirming the positive influence of basalt fibers on the overall quality of the concrete structure.

In general, basalt fiber reinforcement can be considered an effective and **перспективный** method for improving the mechanical properties, crack resistance, and reliability of heavyweight concrete. The optimal parameters determined in this study are a fiber length of 20 mm and a fiber volume fraction of 1.0%, which provide the best balance between mechanical performance enhancement and technological workability of the concrete mixture.

REFERENCES

1. Volkov I.V., Gazin E.M. *Fiber Reinforcement for Concrete* // Proceedings of the 1st All-Russian Conference on Concrete and Reinforced Concrete. – Moscow: Association “Zhelezobeton”, 2011. – P. 1171–1179. (In Russian).
2. Ravindra Narayan Swamy (ed.). *Fibre Reinforced Cement and Concrete: Proceedings of the RILEM International Symposium*. – London, 1975.
3. Rabinovich F.N. *Concrete Dispersedly Reinforced with Fibers*. – Obzor VNIIESM. – Moscow, 1976. (In Russian).
4. Rabinovich F.N. *Composites Based on Dispersedly Reinforced Concrete: Issues of Theory, Design, Technology, and Structures*. – Moscow: ASV Publishing, 2011. (In Russian).
5. Rabinovich F.N., Zueva V.N., Makeeva L.V. *Stability of Basalt Fibers in the Environment of Hydrated Cements* // *Steklo i Keramika*. – 2001. – No. 12. – P. 29–32. (In Russian).
6. Ergashov J.D. *Specific Features of Strength and Deformation Properties of Basalt Fiber-Reinforced Concrete Used in Flexible Reinforced Concrete Elements*. PhD Dissertation. – Tashkent, 2025.

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