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MUHAMMADAMIN KABULOVICH TOHIROVNING TAVALLUDINING 80 YILLIGIGA BAG‘ISHLANGAN “SAMARALI QURILISH MATERIALLARI, KONSTRUKSIYALARI VA TEXNOLOGIYALARI” MAVZUSIDAGI XALQARO ILMIY-AMALIY KONFERENSIYASI ILMIY ISHLARI TO‘PLAMI

Toshkent davlat transport universiteti Rossiya Arxitektura va qurilish fanlari akademiyasining akademigi, O‘zbekiston Respublikasida xizmat ko‘rsatgan yoshlar murabbiysi, texnika fanlari doktori, professor **Muhammadamin Kabulovich Tohirovning tavalludining 80 yilligiga** bag‘ishlangan **“Samarali qurilish materiallari, konstruksiyalari va texnologiyalari”** mavzusidagi xalqaro ilmiy-amaliy konferensiya ilmiy ishlari to‘plami chop etildi.

Muhammadamin Kabulovich kompozitsion qurilish materiallarining polistrukturaviy nazariyasini rivojlantirishga ulkan hissa qo‘shgan olimdir. 1995-yilda Muhammadamin Kabulovich Rossiya Arxitektura va qurilish fanlari akademiyasining (RAASN) xorijiy a’zosi etib saylangan, bu esa ularning qurilish materialshunosligi sohasiga qo‘shgan ilmiy hissasining xalqaro miqyosdagi e’tirofi bo‘ldi. Ular o‘z ilmiy faoliyati davomida 6 ta monografiya, 200 dan ortiq ilmiy maqola va 25 ta ixtiroga mualliflik guvohnomasi yaratganlar.

Ushbu konferensiyaning asosiy maqsadi – qurilish materialshunosligi, bino va inshootlarni loyihalash hamda qurilish sohasidagi zamonaviy ilmiy tadqiqotlar natijalarini muhokama qilish, shuningdek, muhandislik ta’limini takomillashtirish yo‘llarini aniqlashdir.

Konferensiyada O‘zbekiston Respublikasi hamda xorijiy mamlakatlarning oliy o‘quv yurtlari va ilmiy-tadqiqot institutlari olimlari, shuningdek, muhim ilmiy tadqiqot natijalariga ega bo‘lgan ishlab chiqarish vakillari o‘z ilmiy ishlari bilan ishtirok etdilar.

“Samarali qurilish materiallari, konstruksiyalari va texnologiyalari” mavzusidagi xalqaro ilmiy-amaliy konferensiyaning asosiy yo‘nalishlari quyidagilardan iborat:

1. **Resurs va quvvatni tejaydigan qurilish materiallari va texnologiyalari** – zamonaviy ekologik va iqtisodiy talablarni qondirishga qaratilgan innovatsion yechimlar.

2. **Bino va inshootlarning qurilish konstruksiyalari, zamonaviy hisoblash va loyihalash usullari - muhandislik** va texnologik yechimlarni takomillashtirish yo‘nalishlari.

3. **Arxitektura va shaharsozlik** – estetik va funksional jihatlarni uyg‘unlashtirgan zamonaviy loyihalar yaratish.

4. **Zamonaviy muhandislik ta’limi tizimini takomillashtirish** – kelajak mutaxassislarini yuqori malakali darajada tayyorlash uchun ta’lim jarayonini modernizatsiya qilish.

Mazkur konferensiya ilmiy hamjamiyatning turli vakillarini bir joyga jamlab, qurilish materialshunosligi sohasidagi zamonaviy muammolar va istiqbollarni muhokama qilish uchun qulay platforma vazifasini bajardi.

Development of a fine-grained basalt fiber concrete composition for the carriageway structures of reinforced concrete highway bridges

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Abstract: This article is devoted to the study of the physical, mechanical, and operational properties of complexly modified concrete, developed for the structures of the roadway of reinforced concrete highway bridges. Basalt fiber and hydrophobic additives were used as components of concrete composition. Based on the developed composition, samples were created and experimental tests were conducted. Control samples were also used in the experimental work, and the obtained results were compared.

Keywords: Basalt fiber, superplasticizer, hydrophobic additive, water permeability, strength, frost resistance

1. Introduction

Concretes with high performance properties include high strength, low permeability, high corrosion resistance and durability, and concretes with compensated (somewhat restored) shrinkage and expansion, i.e. their combination or the dominance of one of them ensures high strength of structures, depending on the operating conditions.

Preventing the occurrence of cracks and erosion in concrete or reducing the degree of influence on the material properties is achieved by using dispersion-reinforced concretes.[66] The use of such composites allows successfully solving a number of specialized problems: strengthening bridge structures, elements of airfields and hydraulic structures, etc.

Concrete used for the carriageway structures of reinforced concrete highway bridges must meet the requirements for strength, durability and operational reliability. That is, concrete must be resistant to compression (not lower than B30), frost resistance (F200-F300), water resistance (W6-W20) and various other chemical influences.

Obtaining effective building materials and products, which are increasingly demanding today, can be achieved by using technologies using composite materials. One of the promising construction materials is dispersed reinforced concrete. The fiber in the composition of dispersed reinforced concrete is characterized by a matrix with high compressive and flexural strength and significant resistance to elongation and a high modulus of elasticity.

Studying the initial properties of various fibers allows us to select the most effective component for dispersed reinforcement of fine-grained cement concretes, in terms of the ratio of the achieved strength properties and the cost-effectiveness of the designed structural material.

2. Results and discussion

Taking into account the above conclusions, a durable fine-grained hydrophobic basalt fiber concrete composition with high operational performance was developed for the carriageway of reinforced concrete highway bridges.

In this case, the optimal amount and size of complex additives for fine-grained concrete were selected, according to which: 10 mm basalt fiber with a diameter of 19 μm, amount - 3% (of the cement mass); dry hydrophobizer, amount - 0.8% (of the cement mass) and SP, 1.2% (of the cement mass).

Experimental studies were conducted on the basis of the identified compositions, that is, their compressive, flexural, and axial compressive strengths were determined and presented in Table 1. In this case, the control sample (1) and the sample based on the developed composition (2) were compared.

Table 1

Optimized composition of modified concrete

№	Sarf		S/ Sem	Bazalt tolasi (10mm), % (sem.)	G	SP	Siqilishdagi mustahkamlik chegarasi, MPa	Egilishdagi mustahkamlik chegarasi, MPa	O'q bo'ylab siqishga (kgk/sm²)	Bet sin
	Sement	Qum								
1	583	1422	0,41	-		1,2	40,5	3,5	178	B3
2	551	1374	0,38	3	0,8	1,2	57,5	6,5	197	B3

Based on the data in Table 1, it can be concluded that the strength indicators determined in the sample based on the new composition were higher than those in the control sample.

The improvement of operational performance of basalt fiber and hydrophobic additives in the composition has been cited in the literature. These in consideration received without complex modified basalt fiber concrete exploitative features Let's find out .

Fine-grained basalt fiber concrete should have high strength, frost resistance, and water resistance properties, as basalt fiber evenly distributes the material matrix and increases the number of closed pores.

1.Water permeability determination

Water not to transfer to GOST 12730.5- 2018 Rated according to " Wet Stain " Samples size Ø=15cm, h=15cm. Experiment test from soups taken The results are presented in Table 2 .

After the test, the samples were divided and the water penetration depth was determined. According to the test results shown in Table 2, the waterproofing grade of the experimental composition is characterized by the waterproofing grade W16.

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Table 2

Results of determining the water resistance of the control composition with hydrophobizer and optimized composition

Tarkibi	S/Sem	Suvning bosimi, (MPa)	Suv o'tkazmaslik markasi (W)
1	0,41	0,4	W-4
		0,6	W-6
		0,6	W-6
2	0,38	1,6	W-16
		1,6	W-16
		1,4	W-14

2. Research on the cold tolerance of complex modified basalt fiber concrete.

Frost resistance was assessed by the "second method" in accordance with GOST 10060 — 2012. The size of the samples was 10x10x10 cm. The results of the experimental tests are presented in Table 3.

Table 3

Performance characteristics of fine-grained modified concrete

№	Sarf		Siqilishdagi mustahkamlik chegarasi, MPa	Egilish dagi mustahkamlik chegarasi, MPa	O'q bo'ylab siqishga (kgk/sm^2)	Sovuqqa chidamlilik	Suv o'tkazuvchanlik	Beton sinfi
	Sement	Qum						
1	583	1422	40,5	5,5	182	F 300	W6	B35
2	551	1374	57,5	6,8	194	F400	W16	B35

3. Indentation deformation of fine-grained basalt fiber concrete.

The tests were carried out on samples measuring 40x40x160 mm. Deformations were measured based on 160 mm. Calculations were taken after 1 day. We take into account the tests at 3, 7, 14 days and 28 days until the end of the test. The calculation formula for the deformation change:

ε=Δ/l_1

here:

Δ– change in length

l1– initial length

The test results obtained on the creep deformation of the control and basalt fiber concretes show that basalt fiber reduces creep deformations, especially in the first seven days of hardening. The average creep deformation determined by the test results of six samples is 1.06x10-4 mm for the control composition 1 and has changed by -6.94% compared to the initial value, and for basalt fiber concrete with 2 compositions it is 0.86x10-4 mm and has changed by -5.79%.

3. Conclusion

Transferred research this showed that the concrete of strength increase and structure one diversity basalt of fibers cement in the system equal to spread related . Their chaotic distribution cement on the stone open pores to the intersection take comes and open pores number to decrease and of the material general porosity to decrease help This gives and , his in turn , basalt fiber concrete main exploitative indicators noticeable at the level to increase help gives .

Complex of additions optimal in quantity addition as a result complex modified small granular of concrete operational indicators to freeze durability F400, water transfer W16 indicators simple to concrete relatively improvement determined.

References

[1] ГОСТ 25192-2012 Бетоны. Классификация и общие технические требования

[2] ГОСТ 10060-2012 Бетоны. Методы определения морозостойкости

[3] ГОСТ 12730.5-2018 Бетоны. Методы определения водонепроницаемости

[4] Модифицированные бетоны с высокими эксплуатационными свойствами. ООО «Предприятие Мастер Бетон». НИИЖБ и Центр модифицированных бетонов http://www.master-concrete.com/ http://www.master-concrete.com/concrete.htm. 53. Soy V.M., Mukhammadiev N.R., Мелкозернистый базальто-фибробетон для железобетонных конструкций безопалубочного производства // Молодой ученый Международный научный журнал № 47 (546) / 2024, 49-53 с

[5] Махаматалиев И.М., Мухаммадиев Н.Р., Белинский Е.О., Умаров К.С., Гашимов Р.Р. «Способ изготовления железобетонных предварительно напряженных балок пролетных строений мостов» Агентство по интеллектуальной собственности Республики Узбекистан. Патент на изобретение IAP № 07372 от 17.04.2023 г.

[6] Махаматалиев И.М., Мухаммадиев Н.Р., Белинский Е.О., Умаров К.С., Гашимов Р.Р. «Бетонная смесь» Агентство по интеллектуальной собственности Республики Узбекистан. Патент на изобретение IAP № 07520 от 19.10.2023 г.

[7] Горчаков Г.И. Повышение морозостойкости бетона в конструкциях промышленных и гидротехнических сооружений / Г.И. Горчаков, М.М. Капкин, Б.Г. Скрамтаев. – М. : Стройиздат, 1965. – 196 с.

[8] Адилходжаев, А. И., Махаматалиев, И. М., Цой, В. М., Худоёров, А. А., & Ильясов, А. Т. (2023). МЕЛКОЗЕРНИСТЫЙ БАЗАЛЬТОФИБРОБЕТОН НА ОСНОВЕ МЕСТНЫХ МАТЕРИАЛОВ С УЛУЧШЕННЫМИ ЭКСПЛУАТАЦИОННЫМИ СВОЙСТВАМИ. Journal of Academic Research and Trends in Educational Sciences, 224-229.

[9] Бабаев, В.Б. Рассмотрение возможности использования в качестве микроармирующего компонента в дорожном цементобетоне базальтового волокна / В.Б. Бабаев, А.В. Кнотько, А.В. Гаршев // Инновационные материалы и технологии (XX научные чтения): материалы Междунар. науч.-практич. Конф. - Белгород, 1-3 марта 2011 г.-Белгород, 2011. - Ч. 4. - С. 25-27.

[10] Адилходжаев А. И. и др. Прогнозирование эффективности введения минеральных наполнителей в цементные композиты //Научно-технический вестник Брянского государственного университета. – 2019. – №. 1. – С. 105-112.

[11] Muxammadiyev N.R., Malikov G.B., Analysis of the physical and mechanical properties of fine-grained concrete with superplasticizers and hydrophobic additives // Journal of transport scientific-technical and scientific innovation journal VOLUME 1, ISSUE 1 MARCH 2024. 9-12 p.

[12] Muxammadiyev N.R., Malikov G.B., Kompleks modifikatsiyalangan bazaltofibrobetonning fizikmexanik

xususiyatlarini tadqiq qilish // Arxitektura. Qurilish va Dizayn jurnali, Vol.19, Issue2, September 2024. 192-195 b.

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