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Research Article

PREPARATION OF CONCRETE MATERIALS BASED ON HIGHLY DISPERSED MINERAL FILLERS AND RESEARCH OF THEIR PHYSICAL AND MECHANICAL PROPERTIES

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ABSTRACT

The article presents the results of experiments on taking concrete samples and studying their physical and mechanical properties by using wollastonite and vermiculite minerals, which are highly dispersed mineral raw materials, in 2 different ways. According to the obtained results, the strength of the concrete samples was increased by using samples of these minerals in different sizes as fillers and in the composition of the coating.

KEYWORDS

Concrete, wollastonite mineral, porous vermiculite, fineness level, filler, strength, coating.

INTRODUCTION

As you know, concrete is one of the most widely produced and used construction materials today. They are prepared with different contents according to the place of use and the requirements for it. For areas with unfavorable construction conditions, or to manage its durability and improve its quality, various components are included as additives, mainly to increase its fire resistance [1,2].

It was found out from the studies that the material damage caused by the collapse of buildings and structures due to fires is on average 15-18 percent of the total damage caused by fires. When the duration of

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fires in residential areas and administrative buildings is 1-2 hours or more, the internal temperature in the building is up to 1000-1100°C, in places where people gather a lot (theatre and concert buildings, shopping complexes, etc.) 2-3 hours in long-lasting fires, the temperature reaches 1100-1200°C. Cases of large-scale collapse and damage are mainly caused by large and powerful fires in buildings and structures in industrial facilities. Liquid substances stored in industrial buildings and warehouses, foam plastics and other polymer products can reach a temperature of up to 1200°C, and liquefied and compressed gases can reach a temperature of up to 1600°C [3-6].

In case of fire, closed and blocking reinforced concrete structures have the highest heating temperature. The beam and walls will have a higher heating temperature at the top and a lower heating temperature at the bottom.

From researched sources and observations, it is known that concrete and concrete structures can be seriously damaged or collapse due to the high temperatures generated during fires [5,6].

The heating temperature of the concrete surface in the structure depends on the temperature of the fire and where the fire is located. Relying on statistical data on fires, taking into account the probability of fires, it is necessary to correctly determine the fire resistance limit of the reinforced concrete structures in use and whether the structures can be used in post-fire situations. special attention should be paid to identification.

Based on the above, it can be concluded that there are several ways to prevent serious damage and collapse of buildings and structures during fires.

In this research paper, the results of the scientific research carried out in this direction are described, in which, initially, local raw materials wollastonite and vermiculite minerals were crushed and various dispersed fractions were obtained (Table 1).

Various dispersed fractions of wollastonite and vermiculite minerals

№ fraction	1	2	3	4	5
The level of fineness	3,0-4,0 мкм	0,50-1,0 мкм	0,25-0,5 мкм	0,16-0,25 мкм	0,16 дан кичик

It is known that one of the most universal and effective ways to affect the composition, structure, technical, technological and thermal and fire resistance properties of cement-based compositions, including concrete, is to add additives to their composition. Based on this, concrete samples were taken for testing by adding crushed fractions of wollastonite mineral.

Based on the above, in this research work, several samples were taken by adding different fractions of wollastonite mineral to cement binder concrete compositions. The main goal was to improve its thermophysical and physical-mechanical properties by adding a mineral additive to concrete. For this, samples with wollastonite mineral additives were taken for testing.

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In this case, 30x30x4cm tile samples were taken to determine the coefficients of thermal conductivity and heat resistance of concrete with wollastonite mineral additives, and 10x10x10cm samples were taken to study their physical and mechanical properties. (Tables 2 and 3).

Concrete compositions without admixture (standard) and with the addition of wollastonite mineral of various fineness

№	Substance and materials	Amout, kg	Amount, %
Non-additive (control) content			
1.	Cement	0,72	16,55
2.	Gravel	2,38	54,71
3.	Sand	0,80	18,39
4.	Water	0,45	10,34
Wollastonite mineral content, 1.01%			
1.	Cement	0,72	16,40
2.	Gravel	2,38	54,21
3.	Sand	0,80	18,22
4.	Water	0,45	10,25
5.	Wollastonitis	0,04	1,01
Wollastonite mineral content, 5.36%			
1.	Cement	0,72	15,65
2.	Gravel	2,38	51,74
3.	Sand	0,80	17,39
4.	Water	0,45	9,78

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5.	Wollastonitis	0,25	5,36
Wollastonite mineral content, 10.72%			
1.	Cement	0,72	14,75
2.	Gravel	2,38	48,77
3.	Sand	0,80	16,39
4.	Water	0,45	9,22
5.	Wollastonitis	0,53	10,72

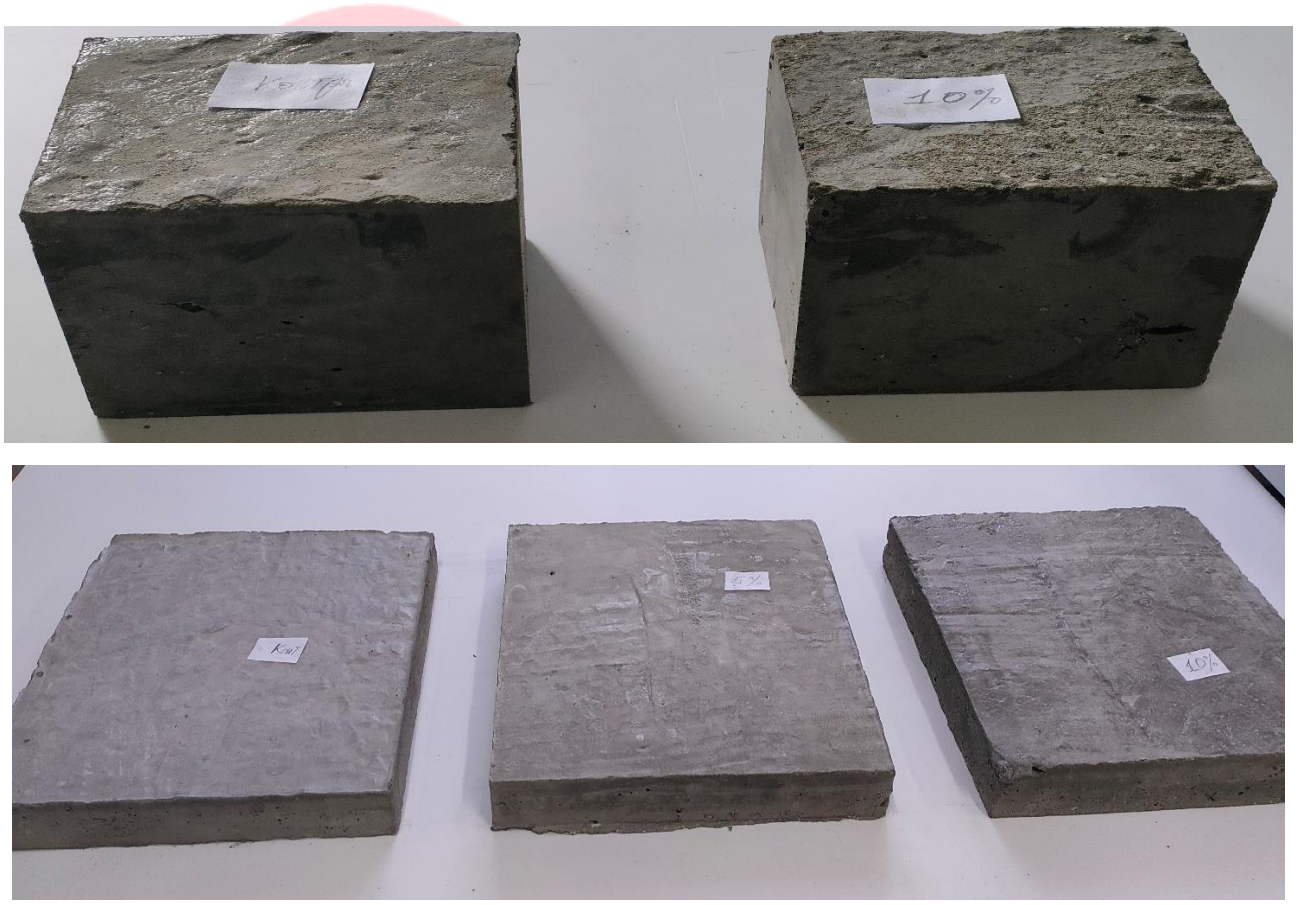

Figure 1. Samples of concrete prepared on the basis of wollastonite and vermiculite minerals.

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The obtained concrete slab samples were tested to determine their thermal and physical-mechanical properties at the next stage of research. From the results of preliminary tests, it was found that concrete samples modified with fillers did not lose their strength even under the influence of temperature up to 10000C (SNOL laboratory furnace).

First, after drying for 28 days, the physical and mechanical properties of freshly obtained (10cmx10cm) concrete samples were studied. The results of studying the physical and mechanical properties of concrete samples containing 1%, 2%, 3%, 10% and 25% wollastonite minerals of different dispersions

It is given in Table 3.

Test results of concrete samples containing wollastonite mineral

Blood.	1%	2%	3%
399,1	350,7	396,7	370,9
38,92	370,5	410,1	395,2
410,5	361,8	390,7	380,4
сред.	ср.	ср.	ср.
399,6	361	399,2	382,2
p	p	p	
40,547	36630,7	40557,6	38782
$R_4 = \frac{P}{S} = \frac{40547}{100}$	$R_4 = \frac{36630.7}{100}$	$R_4 = \frac{40558}{100} =$	$R_4 = \frac{38782}{100} =$
405,47 kgs⁄sm²	**366,3 kgs⁄sм²**	**405,6 kgs⁄sm²**	**387,8 kgs⁄sm²**

The results of the tests revealed that the physical and mechanical properties of concrete samples with 2% wollastonite minerals showed good results: 405.6 kgs⁄cm2. The thermal, thermophysical and fire resistance properties of concrete samples with this composition were studied in the next stage of experiments.

From the results of the above-mentioned research, the effectiveness of local raw materials wollastonite and vermiculite minerals, used by adding them to concrete mixtures and covering the surface in the form of a thin

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layer coating, in increasing the fire resistance of concrete, reinforced concrete structures and materials, found its practical confirmation.

REFERENCES

1. Афанасьев Н.Ф., Целуйко М.К. Добавки в бетоны и растворы. – К.: Будивэлнык, 1989. – 128 с.: ил.
2. Эффективные высокопрочные и обычные бетоны: монография / под общ. ред. В.И. Калашникова. – Пенза : Приволжский Дом знаний, 2015. – 148 с.
3. Строителева, Е.А. Модификатsiя структуры цементных бетонов наполнителем из золы-уноса ТЭС Дальнего Востока: дис. … канд. техн. наук: 05.23.05 / Е.А. Строителева. – Хабаровск, 2006. – 162 с.
4. Жаростойкие бетоны на основе композиций из природных и техногенных стекол/ Ю.П. Горлов, А.П. Меркин, М.И. Зийфман, Б.Д. Тотурбиев - М.: Стройиздат, 1986. – 145 с.
5. Загоруйко, Т.В. Бетон повышенной термостойкости для огнестойких железобетонных изделий [Текст] / Т.В. Загоруйко: дис. … канд. техн. наук. – Воронеж, 2015. – 163 с.
6. Милованов А.Ф. Стойкость железобетоннnх конструкций при пожаре. — М.: Стройиздат, 1998. — 304 с.