



**Journal Website:**  
<http://theamericanjournals.com/index.php/tajet>

**Copyright:** Original content from this work may be used under the terms of the creative commons attributes 4.0 licence.

## Results Of Studying The Physical And Mechanical Properties Of Polystyrene Concrete With Additional Complex Chemical Additive Kdj-3 Based On Local Raw Materials

**Mirzaev Bakhodir Kuziboevich**

Associate Professor, Department Of Production Of Building Materials, Items And Structures, Fergana Polytechnic Institute, Fergana, Uzbekistan

**Abduganiev Numonjon Nabijonovich**

Senior Teacher, Department Of Production Of Building Materials, Items And Structures, Fergana Polytechnic Institute, Fergana, Uzbekistan

### ABSTRACT

The article presents the results of a study of the effect of polystyrene concrete on the physical-mechanical, chemical and operational properties of a complex chemical additive based on local raw materials with an additive KDj-3.

### KEYWORDS

Portland cement, complex chemical additive KDj-3, polystyrene, physical and mechanical properties of polystyrene concrete.

### INTRODUCTION

The addition of a complex additive to the composition of polystyrene concrete mixtures significantly changes their properties. The complex additive increases the mobility of the polystyrene concrete mixture, improves the properties of convenient laying, reduces water demand, etc. The addition of a complex

additive reduces the ratio of water to cement, a decrease in water consumption leads to an increase in the strength characteristics of polystyrene concrete, which opens up the possibility of obtaining high-strength polystyrene concrete. These aspects have a

positive effect on the durability of polystyrene concrete, that is, on its durability.

### MATERIALS AND METHODS

To study the effect of the amount of the complex additive KDj-3 on the physical and mechanical properties of polystyrene concrete, Portland cement PC 400 Do of JSC Kuvasoycement was used. The composition of expanded polystyrene concrete was prepared in laboratory conditions, the mobility of a mixture of concrete of class B1.5 is characterized by conical subsidence of 5 cm.

The results of studies to determine the composition of polystyrene concrete in the Fergana Polytechnic Institute "Building Materials" laboratory showed that the complex additive KDj-3 has the best performance properties.

In order to test the results, to study the effect of the chemical additive KDj-3 on the physical and mechanical properties of polystyrene concrete, experimental studies were carried out on the basis of the Fergana Polytechnic Institute "Building materials" laboratory. All studies Interstate standard «GOST 30459-2008» "Additives for concrete and mortars. Determination and evaluation of effective [one; 52-p.].

The results of the analysis of experimental studies of the rheological properties of the cement mixture and polystyrene concrete mixture showed that the best indicators of the studied mixtures of additives in the amount of 0.4 0.6-1.0 % in relation to the mass of cement are 0.6 % in the mixture.

On the basis of experiments to study the physical and mechanical properties of polystyrene concrete, the optimal amount of

KDj-3 was taken at the level of 0.6 % in relation to the mass of cement [2; 25-p., 3; 22-p.].

After preparation, they were placed in a conventional curing chamber to cure the samples. Samples were tested for 1, 3, 7, 14, 28 days of normal curing.

Were tested samples of polystyrene concrete for strength in compression and bending. The test results are presented in Tables 2 and 3 and in Figures 1 and 2, respectively. Tables 2 and 3 show that the addition of an appropriate amount of the complex additive KDj-3 to the polystyrene concrete composition leads to an increase in the strength of the polystyrene concrete.

Research analysis showed that the strength of polystyrene concrete increased by 20-22 % compared to the control components, and water absorption decreased by 20-25 %. At the same time, it was found that the properties of concrete with a complex additive KDj-3 0.6 % are higher than that of polystyrene concrete with a complex additive KDj-3 0.4-1.0 %. Accordingly, the addition of the KDj-3 complex increases the strength of polystyrene concrete throughout the entire period of hardening.

However, the greatest increase in resistance was observed in the first three days. The greatest strength is provided by the addition of the complex additive KDj-3 in the amount of 0.6 %. The compressive strength after 7 days reaches 76 % of the calculated strength of polystyrene concrete [4; 70-74-b., 5; 5481-5489-b.].

**Table 1. Compositions of polystyrene concrete mixtures of class B1.5.**

#	Name of materials	The composition of the polystyrene concrete mixture, kg		
		1 m <sup>3</sup>	Control mixtures corresponding to 7 litres of mixture	KDj-3 corresponds to 7 litres of mixture supplements
1	Cement, kg	380,0	2,660	2,660
2	Polystyrene granules, kg	17	0,119	0,119
3	Water, l	160	1,120	*1,120-0,84
4	Cement mass relative to KDj-3 0.4%	1,52	-	0,010
5	Cement mass relative to KDj-3 0.6%	2,28	-	0,015
6	Cement mass relatively -3, 1.0%	3,8	-	0,026

\* The amount of water may vary depending on the amount of the complex additive KDj-3.

Dependence of the compressive strength of class B1.5 polystyrene concrete on the amount of complex additive KDj -3.

**Table 2. Addition of KDj-3 complex additive to polystyrene concrete mix**

#	On KDj-3,% in relation to the mass of cement	compressive strength of polystyrene concrete (MPa) in days				
		1	3	7	14	28
1	Control sample without additives	1,2	1,3	1,35	1,5	1,6
2	KDj-3 0,4 %	1,2	1,3	1,4	1,6	1,75
3	KDj -3 0,6 %	1,3	1,4	1,7	1.8	2.0
5	KDj -3 1,0 %	1,3	1,4	1,5	1,5	1,6

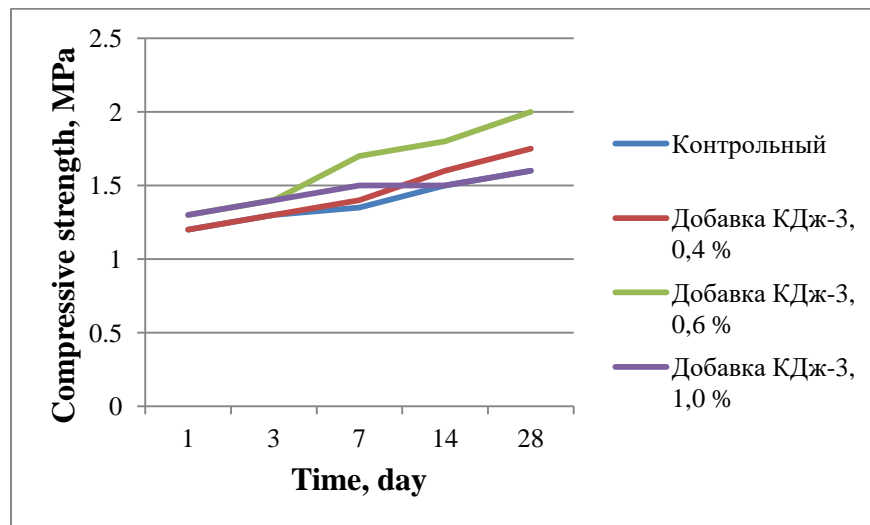


Figure 1. Influence of complex chemical additives KDj-3 on the compressive strength of polystyrene concrete.

The addition of the complex additive KDj-3 to the polystyrene concrete mixture can reduce its water demand by 20-25 % by weight. This increases the compressive strength of the concrete by about 20-22 %, as seen in Tables 2 and Figure 1 above. The flexural strength of polystyrene concrete samples was also tested.

The test results are shown in Table 3 and Figure 2, respectively.

Dependence of the bending strength of class B1.5 polystyrene concrete on the amount of complex additive KDj -3.

Table 3. Flexibility test of polystyrene concrete samples

#	On KDj-3,% in relation to the mass of cement	Flexural strength (MPa) of polystyrene concrete in days				
		1	3	7	14	28
1	Control sample without additives	0,6	0,62	0,65	0,7	0,72
2	KDj-3 0,4 %	0,62	0,65	0,68	0,7	0,72
3	KDj -3 0,6 %	0,64	0,68	0,7	0,75	0,8
5	KDj -3 1,0 %	0.61	0.62	0.65	0.7	0.71

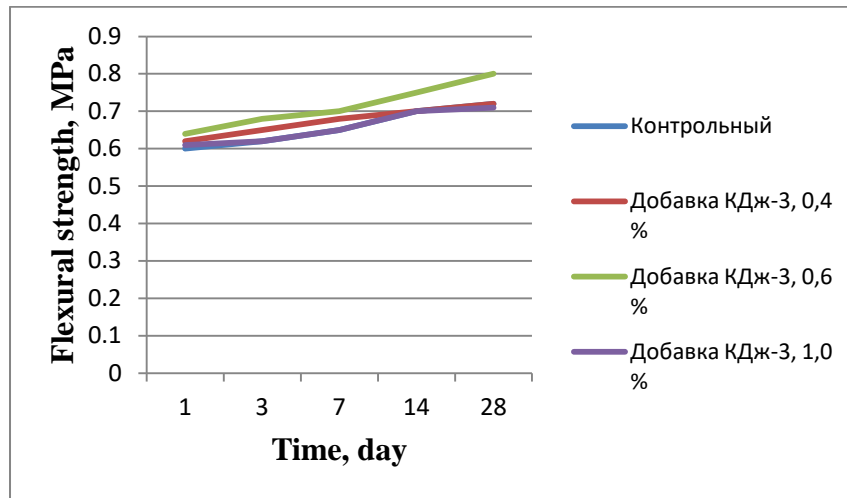


Figure 2. Influence of complex chemical additives KDj-3 on the bending strength of polystyrene concrete.

Studies to determine the effect of the complex additive KDj-3 on the physical, mechanical, chemical and operational properties of concrete, as well as the multifunctional effect (plasticization, initial hardening intensity, and increase in density), showed a higher effect than the traditional superplasticizer.

In conclusion, the results of the study showed that the best effect on the physical and mechanical properties of polystyrene concrete can be achieved by adding a complex additive KDj-3 in the amount of 0.6 % by weight of Portland cement.

## REFERENCES

1. GOST 30459-2008 Additives for concrete and mortars. Determination and evaluation of effectiveness. Gosarkhitektstroy order dated 05.08.2010, No. 52.
2. GOST 10178-85 Portland cement and slag Portland cement. Technical conditions. Date of last modification. 12.09.2018 P. 25.
3. GOST 24544-81 Concrete. Methods for determining shrinkage and creep deformation (with Amendment No. 1). Date of introduction 1982-01-01. P. 22.
4. Samigov N.A., Jalilov A.T., Karimov M.U., Sattorov Z.M., Samigov U.N., Mirzaev B.K. (2018). Strength and frost resistance of a concrete composition with a complex chemical additive KJ-3. *Scientific and practical journal "Architecture Construction Design"*. pp.70-74.
5. Samigov, N. A., Karimov, M. U., Mazhidov, S. R., & Mirzaev, B. K. (2020). Physico-chemical structure of expanded clay concrete properties with complex chemical additive KDj-3 of the "relaxol" series. *International Journal of Psychosocial Rehabilitation*, 24(08), 5481-5489.
6. Kosimov, L., & Kosimova, S. (2021). Optimization of the composition of dry slag-alkaline mixtures. *Збірник наукових праць ЛОГОΣ*.