Spectrum Journal of Innovation, Reforms and Development

Volume 10, Dec., 2022 | ISSN (E): 2751-1731

Website: www.sjird.journalspark.org

INFLUENCE OF HYDROPHOBITED ADDITIVES ON PHYSICAL AND MECHANICAL PROPERTIES OF CONCRETE IN AGGRESSIVE ENVIRONMENT

G'. M. Kadirov
Senior Teacher, Ferghana Polytechnic Institute

Annotation:
The article considers the influence of water-soluble salts on the thermophysical state of building envelopes. At various concentrations of salts, the protection of enclosing structures against changes in sorption and vapor permeability by damping was established.

Keywords: closed constructions, types, properties, physical, chemical and biological processes, moisture, steam, salts, sorption processes, moisture condition, closed materials and pores.

One of the reasons for the destruction occurring in the building envelope at the chemical industry is the pressure that occurs in the pores of building materials due to the accumulation of various salts / salt form (physical corrosion) in them.

Salts penetrate deep into the structure in the form of solutions with moisture condensing on the surface of the crystals. The presence of hygroscopic salts exacerbates the condition of building envelopes, as the sorption properties of building materials are greatly enhanced.

Chemical analysis of samples taken, for example, from the walls of processing plants at potash plants, shows that the pores of the material contain solutions of salts of sufficiently high concentrations. In some cases, the salt content exceeds the solubility limit. This is the main reason for the reduction of the thermophysical properties of the enclosing structures and, as a consequence, their durability [1-26].

Increasing the resistance of building materials in these operating conditions can be achieved by reducing the possibility of penetration of aggressive solutions into the pores.

Organosilicon compounds of various types significantly increase the durability of concrete and mortar. There is reason to believe that in this case a positive effect can be obtained by modifying their properties with air-attracting and hydrophobizing additives.

To this end, the possibility of using organosilicon compounds such as crystalline sodium ethylsiliconate and polyorganoalkoxysiloxane was investigated [1.2].

Organosilicon oligomers of the type of polyorganansalkoxysiloxanes are the product of the joint hydrolysis and esterification of organochlorosilanes and the corresponding alcohols. The molecular structure of these compounds allows you to enter them in concrete in quantities sufficient to obtain a high hydrophobic effect.

Polyorganoalkoxysiloxanes, due to the presence of active functional alkoxy groups in the molecule, enter into a chemical interaction with the calcium hydroxide in the alkaline medium of concrete.

The neoplasm product (polyorganocalcium siloxane) hydrophobizes the surface of the walls of the pores and capillaries, and the alcohol released as a result of the chemical reaction acts as a microfoam.

Studies have shown that oligomers of the type of polyphenylethoxysiloxanes FES have the best hydrophobic properties.

An organosilicon compound of the type ESCH (crystalline sodium ethylsiliconate) is plasticizing, allowing to increase the mobility and workability of the concrete mixture, due to which it is possible to reduce the water-cement ratio or reduce cement consumption. It has an air-entraining effect, which should contribute to the formation in concrete (due to closed air bubbles of small sizes) of a structure with uniformly distributed porosity, giving it increased density and frost resistance. It also enters into chemical interaction with Ca (OH) 2, and neoplasms mosaicly hydrophobize the walls of pores and capillaries in concrete.

We have studied the effect of hydrophobizing additives FES and ESNA on the thermophysical properties and durability of expanded clay concrete used in building envelopes of industrial buildings exposed to sodium chloride solutions [3.4.5].

To study the effect of additives on the thermophysical properties and durability of expanded clay concrete, samples with γ = 1200 kg / m3 were manufactured. Additives were introduced into the concrete mixture in the following amounts: ESNC - 0.1%, FES - 1.0% (by weight of cement). As a standard, samples were made of expanded clay concrete without additives.

Sorption properties were studied on cubes with a rib height of 30x30x30 mm.

To determine vapor permeability, samples with a diameter of 131 mm and a height of 30 mm were made.

Samples for studying durability were fragments of panels with an area of 200x200 mm and a thickness of 300 mm, including protective and textured layers.

The tests were carried out in solutions of sodium chloride of various concentrations, because this salt does not enter into chemical interaction with the components of cement stone and the processes of physical destruction of the investigated materials are not complicated by chemical ones. The concentration of the solutions were taken as follows: saturated solution (359 g / l), 50% and 10% of. saturated.

Studies were conducted on air hardening samples of sorption and vapor permeability at the age of 3 months, durability at the age of 10 months.

All types of tests were preceded by saturation of samples at atmospheric pressure and complete immersion in sodium chloride solutions for 3 days. Control samples were not saturated in salt solutions.

The sorption humidity of saline and control samples was determined by the standard method [6.7.8].

Unlike the standard method, the vapor permeability coefficient was determined not over water, but over a saturated solution of sodium chloride, which avoided moisture condensation in the thickness of the samples under study.

The data obtained during the experiment are presented in table. 1 and in fig. 1, It can be seen from them that as the concentration of the solutions in which the samples were saturated increases, the content of sodium chloride in the latter increases. The introduction of organosilicon additives into expanded clay concrete leads to a decrease in the amount of salt in the dried samples. The difference is especially pronounced in the case of the use of an FES additive.

This can be explained mainly by the fact that the concretes into which the oligomer is introduced have high hydrophobic properties.

In this case, the surface tension at the phase boundary is significantly reduced compared to concrete without additives, which prevents the solution from penetrating deep into the sample.

The entraining ESNC additive turned out to be less effective, but it nevertheless somewhat decreased the salt content in the samples compared to the standard. This occurs, apparently, due to the ordering of the structure of the solution part and the mosaic hydrophobization of the walls of pores and capillaries.

The introduction of organosilicon additives into expanded clay concrete also affects its vapor permeability; as concrete acquires hydrophobic properties, it increases. Moreover, this pattern takes place both in the study of unsaturated concrete and in the study of concrete subjected to saturation with salt solutions.

This phenomenon under conditions of filling the pores of the material with salt solutions should be considered positive for the outer insulating layer of light concrete in the presence of a dense vapor-tight layer on the inside of the fence, because helps to dry the structure from the outside.

It can be explained by a decrease in sorption by girophobized samples and, consequently, an increase in the free cross section of through pores and capillaries, which increases the vapor permeability coefficient of the material.

With an increase in the amount of salt in the pores of the material, the vapor permeability of the latter decreases, which is caused by a decrease in the free cross section of pores and capillaries.

Noteworthy is the increase in vapor permeability with a low salt content (lines 6 and 10), which should be explained by an increase in sorption humidity during salinization. With increasing salt content in the material, the process of reducing vapor permeability by reducing the free cross section of pores and capillaries is predominant [9-20].

The data obtained in determining the sorption moisture of concrete are fully consistent with the previous results: as the salt content in the samples increases, their moisture content increases. However, it decreases when additives are added to the concrete composition. A particularly significant decrease is observed in the case of the use of a hydrophobizing additive FES. The mahimum sorption humidity of samples with an addition of FES at a salt content of 1.54% by weight, which corresponds to preliminary wetting of the sample in a saturated solution, is 2 times less than the sorption wetting of an un populated sample without an additive (Fig. 1c).

Sorption humidity of samples without additives at a salt content of 1.41% by weight, which corresponds to saturation in a 10% solution, is 1.5 times higher than the sorption moisture of an un-salted sample without additives.

To study the durability, fragments of panels with a protective layer on the inside of heavy concrete γ = 2400 kg / m3 of additives with a thickness of 50 mm and an external textured layer of cement-sand mortar with a thickness of 20 mm were made.

The sample was exposed to 75 cycles of alternating unilateral (from the outer surface) freezing (-30 °) and thawing (+ 30 °).

Studies have shown that samples of expanded clay concrete with and without additives, saturated with water, after the test retained their original appearance.
In the samples of expanded clay concrete without additives and with the addition of ESNCs saturated with a solution containing 17.95% by weight sodium chloride, swelling and cracking of the texture layer took place [21-26].
Samples immersed in a solution of sodium chloride of 35.9% by weight after the test completely lost the texture layer.
Samples made of expanded clay with the addition of FES and saturated at various concentrations of sodium chloride solution after the test retained their original appearance.

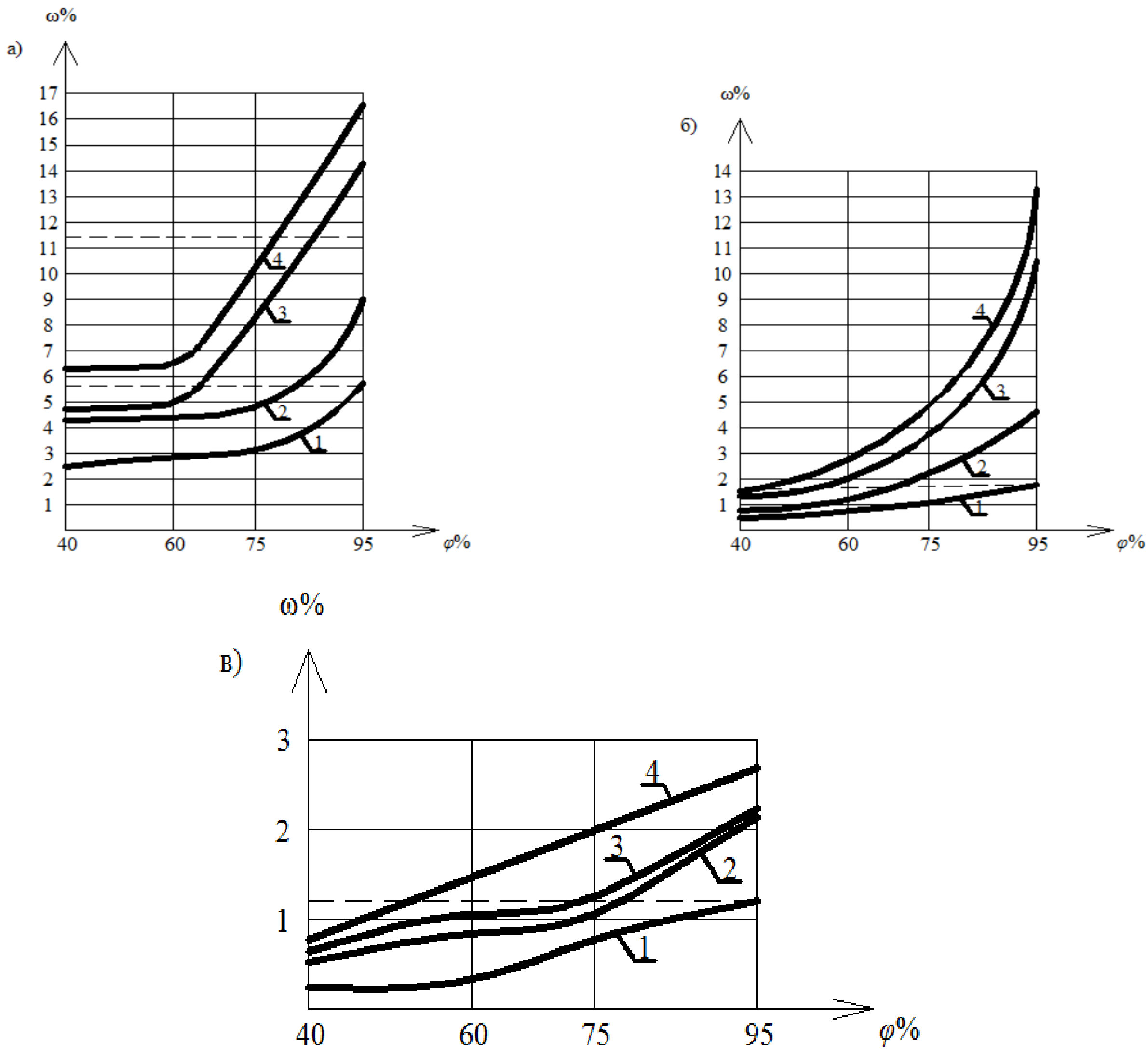

Fig. I. Dependence of the sorption humidity of building materials on the degree of salinity of sodium chloride.
a) expanded clay concrete;
b) expanded clay concrete - with the addition of ESA;
.c) expanded clay with the addition of FES
1 - sodium chloride is absent when soaking in a solution of a concentration of 3.59% per 100 g of water

2 - when soaking in a solution of a concentration of 17.95% per 100 g of water
3 - when soaking in a solution of a concentration of 35.9% per 100 g of water
The salt content in the test samples is given in table. one.
Table 1

No. Batches of samples	Sample Material	The concentration of the solution to saturate the samples with sodium chloride (in grams per 100 g of water)	The content of sodium chloride in the sample in% by weight after drying of the sample	The vapor permeability coefficient of 10-6 in mg / (m.h. Pa)	Sorption humidity Relative humidity in a desiccator in%			
					40%	60%	75 %	95%
1	Expanded clay	0	0	16,8	2,50	2,92	3,05	5,35
2		3,59	1,41	13,1	4,33	4,38	4,91	8,57
3		17,95	3,0	12,38	4,73	4,79	8,34	14,13
4		35,9	19,6	9,85	6,09	6,30	10,59	16,32
5	Expanded clay with the addition of ESNA (0.1% by weight of cement)	0	0	18,8	0,39	0,73	1,08	1,88
6		3,59	0,98	20,4	0,64	1,27	2,16	4,79
7		17,95	-	13,5	1,31	2,11	3,77	10,44
8		35,9	13,45	9,6	1,55	2,75	4,83	13,09
9	Expanded clay with the addition of ESNA (0.1% by weight of cement)	0	0	33,6	0,33	0,51	0,89	1,21
10		3,59	следы	44,1	0,64	0,94	1,10	2,08
11		17,95	0,85	31,6	0,84	1,12	1,26	2,18
12		35,9	1,54	29,3	0,89	1,52	1,99	2,63

The introduction of various types of organosilicon additives into the concrete mix and mortars during their manufacture is one of the ways to protect building envelopes that are operated under the salt form of physical corrosion or high humidity [11.12.13.14].

It is more effective to give concrete and mortar hydrophobic properties to the cement stone in the entire volume of the structure, which becomes possible if a polyphenylethoxysiloxane additive is used.
FES additive increases the durability and thermal properties of building envelopes due to a significant reduction in sorption moisture, including in the presence of salts.
A significant increase in the vapor permeability of expanded clay with an additive in the presence of salts also plays a positive role, as it contributes to more intensive drying of structures.

List of used Literature

[1]. Власов О.Е. Долговечность ограждающих и строительных конструкций (физические основы). Госстройиздат. М., 1963.
[2]. Долговечность строительных конструкций зданий химической промышленности. Сб. трудов под ред. Г.А.Франчук, Ростов, 1968.
[3]. Мирзабабаева, С. М. (2022). Мирзажонович ҚҒ БЕТОН ВА ТЕМИРБЕТОН КОНСТРУКЦИЯЛАР БУЗИЛИШИНИНГ ТУРЛАРИ ВА УЛАРНИНГ ОЛДИНИ ОЛИШ. *RESEARCH AND EDUCATION*, 91.
[4]. Мирзажонович ҚҒ, М. С. (2022). Биноларни ўровчи конструкцияларини тузлар таъсиридаги сорбцион хусусиятини яхшилаш. *RESEARCH AND EDUCATION*, 86.
[5]. Набиев, М. Н., Насриддинов, Х. Ш., & Кодиров, Г. М. (2021). Влияние Водорастворимых Солей На Эксплуатационные Свойства Наружные Стен. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, *1*(6), 44-47.
[6]. Momin, N., Mirzajonovich, Q. G., Tursunalievich, S. B., & Gayradjonovich, G. S. (2021). Reception of improving the microclimate in the houses of the fergana valley. *The American Journal of Engineering and Technology*, *3*(06), 92-96.
[7]. Gayradjonovich, G. S., Mirzajonovich, Q. G., Tursunalievich, S. B., & Ogli, X. A. M. (2021). Corrosion State Of Reinforced Concrete Structures. *The American Journal of Engineering and Technology*, *3*(06), 88-91.
[8]. Ogli, A. U. A., Ogli, X. A. M., & Mirzajonovich, Q. G. Hazrati Imam Architecture The Complex Is A Holiday Of Our People.
[9]. Кодиров, Г. М., Набиев, М. Н., & Умаров, Ш. А. (2021). Микроклимат В Помещениях Общественных Зданиях. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, *1*(6), 36-39.
[10]. Ogli, X. A. M., Ogli, A. U. A., & Mirzajonovich, Q. G. (2020). Ways Of Implementation Of Environmental Emergency Situations In Engineering Preparation Works In Cities. *The American Journal of Engineering and Technology*, *2*(11), 108-112.
[11]. Mirzajonovich, Q. G., Ogli, A. U. A., & Ogli, X. AM (2020). Influence Of Hydro Phobizing Additives On Thermophysical Properties And Long-Term Life Of KeramzitObetona In An Aggressive Medium. *The American Journal of Engineering and Technology*, *2*(11), 101-107.
[12]. Ғ Қодиров, О Турабоев - бино ва иншоотлардаги ёпма конструкцияларнинг намлик режимида тажриба усуллари Eurasian Journal of Academic Research, 2022/6/30 369-376

[13]. Qodirov G'iyozjon Mirzajonovich Suv tozalash inshooatilarni texnologik jarayonlari va to‘suvchi konstruksiyalarga agressiv muhit ta’siri Farg'ona politexnika instituti Ilmiy-texnika jurnali 2022/6/29 154-157

[14]. УА Мирзаахмедова, ГМ Кадиров ТЕХНОЛОГИЧЕСКИЕ ФАКТОРЫ ОПРЕДЕЛЯЮЩИМ СТРУКТУРУ ПЕНОБЕТОНА INTERNATIONAL CONFERENCES ON LEARNING …, 2022 2022/5/30 265-269

[15]. Asrorovna A. Z. et al. OPTIMIZATION OF CORROSION-RESISTANT CONCRETE WITH CHEMICAL ADDITIVES //Spectrum Journal of Innovation, Reforms and Development. – 2022. – Т. 8. – С. 296-303.

[16].Mahkamov Y. M., Mirzababaeva S. M. Design Model Of Bending Reinforced Concrete Elements Under Action Of Transverse Forces Under Conditions Of Increased And High Temperatures.

[17]. Mirzaakbarovna M. S. et al. DEVELOPMENT OF EFFECTIVE METHODS OF STRENGTHENING DAMAGED WALLS OF BUILDINGS TO BE RECONSTRUCTED //Spectrum Journal of Innovation, Reforms and Development. – 2022. – Т. 8. – С. 325-331.

[18]. Abdugofurovich U. S. et al. COMBINED COMPOSITE REINFORCED CONCRETE BEAMS //Spectrum Journal of Innovation, Reforms and Development. – 2022. – Т. 8. – С. 317-324.

[19]. Mirzaakbarovna M. S. Wood Drying In Construction //The American Journal of Applied sciences. – 2021. – Т. 3. – №. 05. – С. 229-233.

[20]. Mirzaakbarovna M. S. Determining the Value of Coniferous Wood Drying //Miasto Przyszłości. – 2022. – С. 104-107.

[21]. Ахмадалиев А. Х., Мирзабабаева С. М. КОМПОЗИТ АРМАТУРАЛИ ЭГИЛУВЧИ ТЎСИНЛАРНИНГ ЮК ОСТИДА КУЧЛАНИБ ДЕФОРМАТЦИЯЛАНИШИ //Eurasian Journal of Academic Research. – 2022. – Т. 2. – №. 6. – С. 416-423.

[22].Mirzaakhmedova, U. A. (2022). ISSUES OF INCREASING THE OPERATIONAL RELIABILITY OF EXISTING BUILDINGS AND STRUCTURES. Spectrum Journal of Innovation, Reforms and Development, 8, 341-347.

[23]. Mirzaakhmedova, U. A. (2022). LOSSES OF PRESTRESS FROM SHRINKAGE AND NON-LINEAR CREEP OF CONCRETE OF REINFORCED CONCRETE ROD SYSTEMS. Miasto Przyszłości, 24, 286-288.

[24]. Abduxalimjonovna, M. O. (2022). Assessment of the Service Life of Reinforced Concrete and Steel Elements. Texas Journal of Engineering and Technology, 9, 65-69.

[25]. Mirzaxmedova, O. I. A. (2022, May). BINOLARNING KONSTRUKTIV ELEMENTLARIDA UCHRAYDIGAN SHIKASTLANISH VA DEFORMATSIYALARNI BARTARAF ETISH. In INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING (Vol. 1, No. 8, pp. 209-215).

[26]. Takhirovich, M. A., & Abdukhalimjohnovna, M. U. (2021). Protection Of Reinforced Concrete Coverings. The American Journal of Engineering and Technology, 3(12), 43-51.

10. Абдуллаев, И. Н., Умирзаков, З. А., & Умаров, Ш. А. (2021). Анализ Тканей В Фильтрах Систем Пылегазоочистки Цементного Производства. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 16-22.

[27]. Умаров, Ш. А. (2021). Исследование Деформационного Состояния Композиционных Арматурных Балок. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 60-64.
[28]. Umarov, S. A. (2021). Development of deformations in the reinforcement of beams with composite reinforcement. Asian Journal of Multidimensional Research, 10(9), 511-517.
[29]. Asrorovna, A. Z., Abdug‘ofurovich, U. S., & Sodiqjon o‘g‘li, S. F. (2022). ISSUES OF IMPROVING THE ECONOMY OF BUILDING MATERIAL-WOOD PRODUCTION. Spectrum Journal of Innovation, Reforms and Development, 8, 336-340.
[30]. Asrorovna, A. Z., Abdugofurovich, U. S., & Mirzaakbarovna, M. S. (2022). OPTIMIZATION OF CORROSION-RESISTANT CONCRETE WITH CHEMICAL ADDITIVES. Spectrum Journal of Innovation, Reforms and Development, 8, 296-303.
[31]. Abdugofurovich, U. S. (2022). BONDING OF POLYMER COMPOSITE REINFORCEMENT WITH CEMENT CONCRETE. Gospodarka i Innowacje., 24, 457-464.