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# CHEMICAL AND MICRO-COMPOSITION PRODUCTION OF ORGONOMINERAL (ALZ) LOW GRAVEL CONCRETE MIXTURE

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**Abstract**
The article is based on the chemical and microstructural formation of a low-gravel concrete mixture using organomineral additives, and the determination of the specific negative effects of additives in the contact zone of fillers as a result of the formation of a concrete composition.

**Keywords:** Acrylic lignosulfonate sealant ALZ, OMQ, development on the basis of Arol sand and low-gravel concrete, chemical and microstructure, concrete mixture.

## Introduction

Nowadays, in urban construction and landscaping, in particular, in the production of slag blocks, curbs, paving slabs, and local decorative construction prefabricated concrete paving slabs, in order to solve the problem of increasing the efficiency of low-gravel concrete, the production based on Aral sand and the use of organomineral active additives that have the unique structure and properties of low-gravel concrete mixtures, as well as mechano-chemical activation, which allows obtaining local building materials, is a specific problem. One of such wastes is the low-quality, that is, unusable products that arise during the production of reinforced concrete products. Fillers in traditional heavy concrete occupy 80% of the volume of concrete and significantly affect its technological and operational properties. In this regard, aggregates are subject to special requirements, taking into account their specific characteristics, their influence on the properties of concrete mixtures [1].

of secondary aggregates to the aggregate surface can be estimated from the degree of adhesion of the aggregate surface to the cement stone. The aggregate surfaces have the following types of surface finishes: strong, weak, smooth, very smooth, polished, etc [2]. Studies of such aggregates in concrete have shown that by changing the shape and smoothness of the aggregates, the change in the tensile strength of the concrete decreases [3].

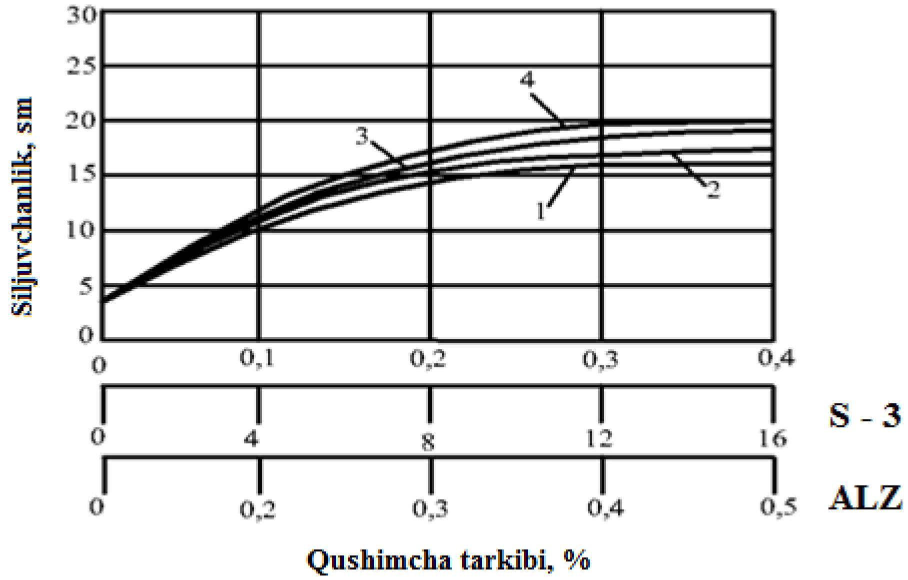
A complex characteristic that depends on the gap between the inner and outer cylinders filled with cement paste. The tests were conducted at a dose of 7 kyl "shear rate - gap between coaxial cylinders".

Table 1 Rheological properties of plasticizing cement pastes with ALZ lignosulfonate additives (W/C=0.4 and temperature 20°C).

| Plasticizer, % by weight of cement | Dynamic viscosity of cement pastes, η, with shear stress gradient cP, D,s $^{-1}$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.8 | 3 | 5.4 | 9 | 16.2 | 27 | 48.6 | 81 | 145.8 | 243 | 437.4 |
| Without plasticizer | 2450 | 2270 | 60 | 10 | 1475 | 90 | 340 | 10 | 30 | 83 | 79 |
| 0.46% C-3 | 2401 | 1876 | 70 | 85 | 1198 | 101 | 990 | 88 | 73 | 52 | 33 |
| 0.25% ALZ | 3602 | 3282 | 78 | 90 | 1105 | 990 | 887 | 93 | 766 | 549 | 841 |

Table 1 shows that cement pastes with the studied plasticizers (ALZ) have better formability at different intensities of mechanical stress than pastes with known C-3 superplasticizers. It was found that the change in viscosity depends on the mechanical impact force. The results obtained show that plasticizers are used not only to obtain workable concrete mixtures, but also to ensure the uniformity of the properties of the mixture, in particular, to ensure their stability during transportation and placement. Taking into account the results of experiments on determining the viscoplastic properties of cement pastes, work was carried out to determine the dependence of the workability of the concrete mixture on the dosage of plasticizers. It should be noted that workability is a technological property of the concrete mixture, characterized by the ability to fill the mold or formwork and compact under the influence of mechanical forces; at the same time, the concrete mixture must maintain its uniformity and not fall into layers [4]. The water content of the concrete mixture, which primarily depends on the amount of mixed water, and the method of compaction are the most important factors in the quality of the concrete structure.

An important means of regulating the workability of concrete mixtures are chemical modifiers, which are surface-active substances. These substances reduce the surface tension of water and thereby reduce its wetting ability . This makes it possible to reduce the water-cement ratio and improve the properties of hardened concrete without compromising the workability of the mixture: density, strength, frost resistance, etc. It is also observed that the loss of plasticity of a concrete mixture with a superplasticizer over time is significantly dependent on the composition of the concrete mixture and the quality of the sand. The workability of a mixture modified with a superplasticizer improves with an increase in cement and water, i.e., the volume of cement paste in the concrete mixture, the fluidity (movability) of the concrete mixture, is directly dependent on the volume and fluidity of the cement paste. We studied the effect of the proposed modifier on the mobility of concrete mixtures, and these results are presented in Figure 1.




1 Effect of plasticizers on mobility in concrete mix
1 - content 0.46%, S-3 K Sh B; 2 - content 0.25%, K Sh B; 3 - content 0.46%, CIS; 4 - content 0.25%, MDB;

Figure 1 shows the effect of modifiers on the mobility of the concrete mixture The proposed acrylic cement lignosulfonate modifier ALZ, accordingly, C-3 (composition 3) up to 11% and increases the workability of the concrete mixture. In fact, we can confirm that at one time M.I. Khigerovich, when creating hydrophobic cement concrete, changed the properties of cement in such a way that it became less hydrophobic and even had water-repellent properties, but at the same time it can interact with water at the stages of practical application [5,6]. Thus, the results of studying the quality of the concrete mixture in terms of workability allowed us to conclude that the acrylic cement lignosulfonate modifier ALZ is not only comparable with the well-known superplasticizer C-3, but also slightly exceeds it in terms of its thinning effect.

The high quality of concrete mixtures with the ALZ modifier was confirmed by experiments on the effect of water consumption on water demand, water separation and delamination, which made it possible to determine their workability, and this is presented in Tables 2 and 3.

Table 2 Effect of plasticizing modifiers on water demand and concrete mix density

| Addition , ts ement weight % | Water demand l/m $^3$ | Reduction in water demand, % | Medium density kg/m $^3$ |
|---|---|---|---|
| No additional | 220 | 0 | 2400 |
| 0.46% C-3 | 209 | 11 | 2389 |
| 0.25% ALZ | 189 | 20 | 2368 |

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Table 3 Water requirement of concrete mixtures

| Additive, Weight % of Cement | W/C | Water requirement of concrete mix , % |
|---|---|---|
| No additional | 0.75 | 0.9 |
| 0.25% ALZ | 0.44 | 0.4 |
| 0.25% ALZ | 0.4 | 0.5 |
| 0.25% ALZ | 0.68 | 0.6 |
| 0.25% ALZ | 0.59 | 0.2 |

The results presented in Table 3 show that the ALZ modifier has a lower water loss rate than concrete mixtures without additives. Production workers noted these positive aspects when carrying out work using the ALZ modifier. The data obtained on concrete mixtures with additives correspond to the fundamental works of Yu.M. Bazhenov. Bazhenov V.G. Batrakova G.I. Gorchakova M.I. Khigerovich V.I. Solovyov and others[7,8].

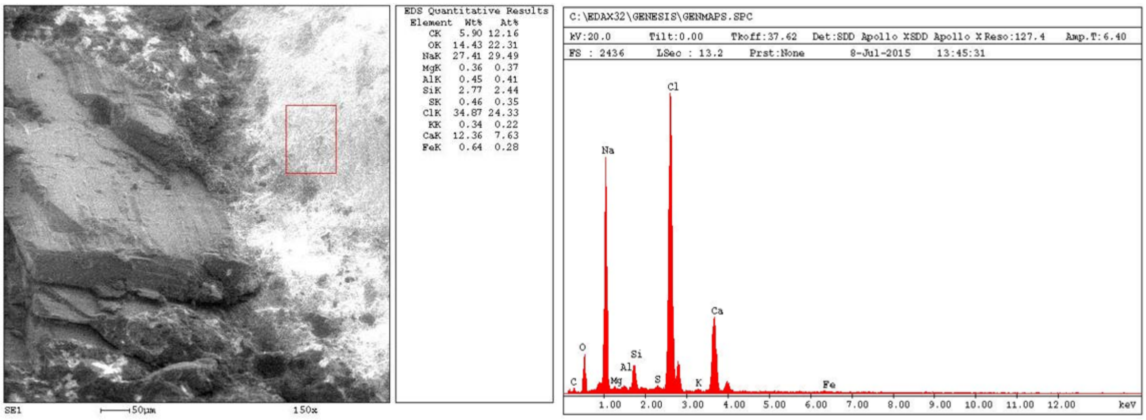


Figure 2. Chemical and microstructural analysis of low-gravel samples based on secondary aggregates is in Appendix S-3

The results of the study showed that the results of the low-gravel concrete samples based on recycled secondary aggregates with C-3 superplasticizer and low-gravel concrete based on recycled secondary aggregates with the addition of ALZ and without plasticizer, it can be seen that quartz ($SiO_2$); Feldspar Albite ($NaAlSi_3O_8$) and Microcline ($KAlSi_3O_8$); Mica annite ($KFe_3Si_3AlO_{10}(OH)_2$); Carbonate mineral calcite ($CaCO_3$); Clinker phases - C3C ($Ca_3SiO_5$), β-C2C ($Ca_2SiO_4$), C4AF ($Ca_4Al_2Fe_2O_{10}$); Carbonate minerals calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$); Qualitative X-ray phase analysis of mineral components such as sodium chloride (NaCl) showed the same phase composition in all three selected compositions.

Based on the results of theoretical and experimental research, the following conclusions can be made:

The results of the study showed that S-3 plasticizer additives were used in fine-grained concrete samples, and low-gravel concrete samples developed on the basis of Arol sand with ALZ acrylic lignosulfonate sealing additive were found to have the same phase composition. The values of the amorphous phase of the samples were on average 15% from each other, the results showed that the results of these samples were not negative and that the amorphous phases of the material were intensively close to each other.

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