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The Role of Binders and Fillers in the Study of Concrete Properties

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Annotation: This article is an analysis of the directions of use with an assessment of the possibility of using glass grinding clay in the production of concrete. The use of modern technological approaches in the formation of products to significantly improve the quality of concrete and increase its properties.It consists of the preservation of Natural Resources, the use of waste materials and the production of concrete with improved properties by adding glass waste to concrete.

Keywords: glass waste, superabsorbent, cement, energy efficient, concrete production.

Introduction: Due to the rapid development of the construction industry, the demand for concrete and reinforced concrete structures made using portlandsement is increasing. In this respect, in the production of concrete and reinforced concrete structures, one of the priorities of the building materials production industry, there is a great emphasis on the use of existing local raw materials and industrial waste, moderating production technologies, improving the quality of the product produced, reducing its cost. In addition to optimizing the composition of concrete mixtures used for the production of concrete and reinforced concrete structures, there are many R & D works aimed at the use of industrial waste, chemical and mineral additives in their preparation, targeted management of the formation of a structure in hardened cement stone. In this regard, it is important to use chemical and mineral additives in order to increase the resistance of concrete and reinforced concrete structures to the harmful effects of the environment, especially groundwater, ensure the comfortable fit of the concrete mixture, accelerate the initial strength of concrete by intensifying its hydration, and ensure high strength, and at the same time improve the strength of.

Main part: a positive effect similar to reducing drying shrinkage (by 12.6%) and autogenic shrinkage (by 15.5%) is described using self-leveling mortar as an example. In this case, the effect that forms the process of shrinkage and hardening is significantly manifested in the period of 28 days.

Determination of the effectiveness of the use of SA to reduce the plastic shrinkage of cement materials according to a study of scientists studied the effect of various dispersion additives (fractions of 0-200 μm and 200-500 μm) under different heat and humidity. working conditions. The thinness of the reduction of horizontal deformations was 20 and 17%, respectively, for compositions of less than 200 μm and 200...500 μm.

SA efficiency of 0.3% by weight of Portland Cement has also been shown to reduce autogenic shrinkage of concrete. In addition, the degree of impact depends on the water/sem ratio: the smaller the initial amount of water, the smaller the shrinkage reduction effect.

The use of SA is associated with a number of difficulties. For example, sa polymer granules require adjustment of water consumption in mixtures to maintain mobility. According to it, the dispersion diameter of mixtures containing irregularly shaped SA microparticles decreases from 210 to 170 mm. in it, the mobility of the concrete mixture remained the same, since the water absorbed by the SA actually contributed to an increase in the water-cement ratio by 6.7-20%. According to the data, the increase in the amount of superabsorbent polymers contained in cement mortar is accompanied by a decrease in bending and pressure by 20.5 and 25.8%, respectively. This is explained by the change in porosity, which is additionally formed after the desorption of SA.

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Based on the results of the study, analyzing the effect of SA on the mechanical properties of concrete for 28 days, they conclude that there is a clear negative effect: the decrease in pressure strength when hardened IS from 8 to 35%. in conditions with high humidity and up to 28% - with low humidity. At the same time, the opposite results (a decrease in pressure strength by 10-13% at the same time with an increase in bending strength by 7% from a decrease in bending strength by 33%, were indicated by samples hardened under hermetic influence.

Thus, the use of superabsorbent polymers in cement composites is characterized by positive and negative effects.

On the one hand, the use of SA as a water carrier to ensure the hydration of the binder is justified by the positive effect of reducing shrinkage. On the other hand, the granulated polymer component not only requires pre-saturation (up to 30 minutes), but also serves as a source of additional holes in the composite structure, in order to ensure sufficient mobility of the mixture, which complicates the technology of concrete production. promotes a decrease in mechanical properties. At the same time, desorption kinetics are crucial to improving the efficiency of SA, in which sufficient water migration is carried out on the contrary, not on the cement stone arising from the reserve fund of polyacrylates. The factors affecting these processes are the properties of the polymer's cross-linking, the shape and size of its granules, and the properties of the pore-forming. Concrete properties, for the control of Mixtures and in the economy of cement, various additives are mixed into the concrete, dividing them into two groups.

In Group 1-chemicals, a small amount (0.1-2% cement mass) is added to the concrete composition to change the concrete mixture and the nature of the concrete to the desired side.

Figure 1. Tiny additional materials

Figure 2. Additives regulating the properties of the concrete mix:

Group 2-finely ground materials are added to the composition of concrete in an amount of 5-20%, and in order to save cement, or to obtain a fairly dense concrete, spending a small amount of cement. Fine-milled additives include Ash, milled slag, sand, rock grinding waste and other materials, which give concrete maxhsus properties (increasing density, heat-resistant, changing current permeability, staining, etc. At the last time, more and more chemical additives are used.

Additives that regulate the properties of the concrete mixture:

1. Additives that regulate the properties of the concrete mixture are: plasticizer, that is, one that increases the hardness of the concrete mixture; stabilizer, that is, one that prevents the folding of the concrete mixture; water preservative, one that reduces water separation;

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2. The teething of the concrete mixture, and the joints that regulate the hardening of the concrete; the teething accelerator, the teething retardant, the hardening accelerator, the anti-Cold (anti-Cold);
3. Concrete mixture and additives that regulate the density and porosity of concrete: air-absorbing, gas-forming, foam-forming, compacting (air-releasing and concrete porosity-dressing), regulating concrete deformation, expansion additives;
4. Additives that give concrete special properties: hydrophobizing, that is, reducing the moisture content of concrete; anti-corrosion, that is, increasing resistance to aggressive environments, inhibitors of steel corrosion, increasing the property of preserving concrete in relation to steel; dyeing; enhancing the bactericidal and insecticidal property.

Table 1. Physical and mechanical properties of sand

№	Mass density, kg / m^3	Exact density, kg/m^3	Space size, %	Content, %	
				dust and clay particles	Organic mixtures
1	1343	2630	48,9	0,5	-

Table 2. Features of glass waste additive

Index names	Indicator value
Density, kg / m^3	1100
ph	7
Polymerization Rate, min	0.25 to 45
Binding force, MPa	0,2
Stretch stretch, %	300
Application temperature, °C	0 to 40
Biological stability	stable
Vapor permeability	Conditionally vapor permeable

The analysis of the structure of glass waste and methods for studying complementary substances on their basis is the subject of dissertation work. The availability of the necessary equipment, the relative simplicity of the research stages and the high reliability of the final results determined the selected methods of experimental research of this work.

For the preparation of samples:

- cube molds with geometric dimensions 10x10x10 CM;
- rotating granulator.

To determine the strength characteristics of the composite mixture, each sample is designed according to the requirements. For this, a technique based on the following steps was used: first water and superabsorption were added to the mixer, then Portlandsement. All components were mixed in a mixer at a slow speed for 5 minutes until smooth. After that, sand was added to the mixture, and all components were mixed at medium speed for another 3 minutes.

After mixing, the mixture was placed in molds measuring 10 cm × 10 cm × 10 cm, then placed on the vibration for 1 minute to get rid of air bubbles.

The samples were hardened under normal conditions: in accordance with gost 18105-2018 " concretions in the CU-40b normal hardening chamber. Power control and evaluation rules" temperature for a day – 20 °C Vanam – 80...In a normal hardening chamber providing 85% stabilization, it was then deepened, measured, weighed, additionally strengthened and prepared for testing under the same conditions for 27 days.

For some studies, the rotor is shaped by the method of forming using a granulator device, which is used in the formwork. Ingredients were added to the granulation device according to the specific proportions in which the required rotor speed was set. During the forming process, the mixture affected the centrifugal force caused by the rotation of the granulator rotor, resulting in round granules 3 to 8 cm in diameter. After the formation process is complete, the granules are removed from the granulator and left to dry and ripen for 28 days.

The frost resistance of the samples was determined by the standard method. Before testing began, samples measuring 100x100x100 mm were stored under normal conditions (temperature 20°C, relative humidity 60%) for 28 days to achieve maximum power. Each freezing and thawing period lasted 24 hours and had a freezing period at -18°C and a thawing period at +2°C. A total of 10 freezing and thaw cycles were conducted.

Research results:

In the formulas and tables that can be determined to calculate the composition of concrete, the uniformity of fillers, the presence of rocks with different strength in them, was not taken into account.For this reason, after calculating the composition of concrete, the experimenter conditions, having prepared a solution, its brand will be checked.

If the strength of the sample after 28 days satisfies the project requirement, then this composition of concreting is recommended for construction. The properties of the materials used in the calculation of the composition of concrete are determined in the dry state in the experiment.

If it is necessary to add joints to the concrete, then the joint is bent to match the degree of grinding of the cement and mixed into the mixture before watering. The consistency, which is suitable for concrete, is determined in the experiment. There are many methods for calculating the composition of concrete. When choosing these methods, great attention is paid to the cement consumption for 1m3beton, its strength and durability. Within these, the most economical method is selected.

B.G.The method of absolute volumes, developed as a result of deep inspections of skramtaev, is the most convenient and accurate method for calculating the composition of concrete.

Calculation of the composition of concrete 1m3 from the determination of the masses of cement (TS), water(S), sand (K,) and large fillers (SH) spent on concrete. The composition of the concrete being selected is assumed to be absolutely dense, and the volume of its contents is determined in the absolute state. Then calculated, based on the product, a mixture is prepared, and its degree of thickness is checked for the placeability of the vaqulay.

The water Cement (S/TS) ratio corresponding to the concrete brand is prof.B.G.It is determined using the formula proposed by Skramtaev.

S / TS = A1/Rts(Rb-0.5/A1/Ru

in this: RB-The strength of concrete after 28 days; RTS - the brand of portlandsement; A and A1-depend on the quality of the fillers, which have coefficients, A=0.65 for a high-quality filler, a=0.6 for ordinary fillers.

Consequently, once the S/TS ratio is determined, the amount of water is found by putting the formula vaTS=s/(s / TS) to determine the amount of cement.

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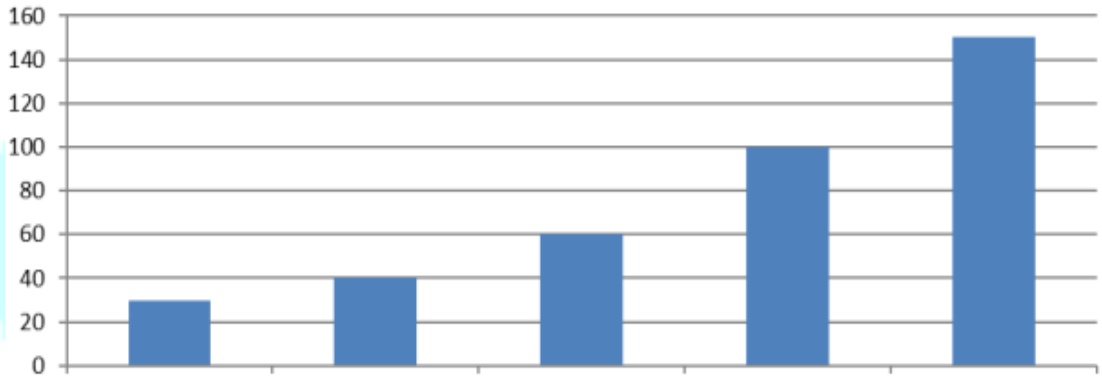
For the preparation of a convenient concreting concrete mixture, a mixture of cement, sand between large fillers should be sufficient.

Features of complex chemical additives in a concrete mixture:

In recent years, research into the use of high-performance plasticizers called superplasticizers (SP) has been of great interest. These substances differ from ordinary, conventional plasticizers in their high plasticizing effect

The first superplasticizers appeared in the early 70s of the last century as a result of research by Japanese and German specialists in the field of concrete research and design. The main idea of using these additives was to obtain molded concrete mixtures without mechanical effects.The main advantage of superplastifiers is that despite the strong dilution effect, they do not reduce the strength of the concrete, and therefore their use in larger doses compared to conventional plasticizers allows for a higher plasticization effect. The use of superplastifiers and complexes based on them made it possible to significantly increase the average and maximum strength of concrete, while increasing the activity of cements.



From the beginning of the XX century 1930y.until 1940y. 1950-1960y. 1970-1990y. 2000-2020y.

Figure 2. Dynamics of the maximum increase in concrete strength by the years of the 20th century

Today, superplastifiers are synthesized and extracted from organic compounds. Using them in optimal quantities allows you to obtain bulk or super-mobile mixtures from dark concrete mixtures (KCh = 2-4 cm), without reducing the strength. (OK = 18-24 CM).

According to its chemical composition, all superplastifiers (SP) can be divided into four groups:

- the first group includes SP, which is obtained on the basis of sulfate melaminformaldehyde Tar (SPMF) ;
- the second group includes additives based on naphthalene sulfonic acid and polycondensation products of formaldehyde (SP NF);
- the third group includes polycarboxylate and polyacrylates (SP P) - based additives;
- the fourth group includes modified lignosulfonates (SP LST).

From previously used plasticizing additives, modern superplasticizers differ in the fact that their chemical composition does not change and the technical requirements of the products in the corresponding technical specifications are strictly followed.

The mechanism of action of superplastifiers in species NF, MF, LST is dominated by electrostatic repulsion and stabilization of cement particles. In this, the adsorption layers of SP molecules increase the value of the potential

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on the surface of the cement particles. The value of the Z–potential depends on the adsorption capacity of SP, in addition the higher the adsorption value, the larger the absolute value of the manfmy-charged ζ-potential.

The role of ζ-potential is less in the P-type SPs mechanism of action, while the mutual push and suspension stabilization of cement particles is provided by a dominant steric effect.

Most experts associate this difference with the structure of SP molecules: NF, MF, LSTs are characterized by the linear shape of the polymer chain;for SPs of type P, transverse bonds of two or three-dimensional shape are characteristic. Forming an adsorption volumetric protective shell around solid phase particles, it prevents the particles from sticking together and forms crosslinks that promote their mutual push. It is the transverse zveno that forms an adsorption volumetric protective shell around solid phase particles and promotes the non-overlapping and cross-pushing of particles.

Some studies have cited data that the mutual push forces of P-type SPs are almost twice as large as those of MF and NFS, and three times as large as LST.

In the literature, this group of SP called "hyperplasticizers". They differ from traditional superplastifiers in having a higher water demand reduction property (30% or higher) compared to ordinary SPs, A Higher plasticization property even at a lower water-cement ratio (0.2 for cement dough), and low utilization (~0.2%).

Conclusion: In conclusion, such tasks as high-quality production of traditional building materials on a scientific basis, adaptation of the technologies for their creation to the requirements of the time, development of inexpensive, economical, high-quality objects and technologies, obtaining new and thorough materials, creating their cost-effective technologies, perfecting the methods of repair and reconstruction of buildings and structures, as well as

The mechanism of pore formation in glass waste concrete fillers is an important problem that attracts the attention of many researchers and engineers in the field of materials science and production technology. Glass waste fillers such as absorbent polymer material are used in various industries such as construction, automotive, furniture, etc. These materials have a number of advantages over other fillers, which are: weight, good heat holder, noise barrier, moisture and chemical resistance.

One of the main requirements for glass waste concrete fillers is the presence of holes in their structure, which provide air permeability, gas permeability and moisture permeability properties. The porous structure of fillers ensures good dispersion of gases and liquids, which is an important factor in achieving the desired properties of fillers.

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