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The Role of Chemical and Mineral Additives in the Development of High Strength Concrete Composition

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ABSTRACT

Prepared article, the role of chemical and mineral additives in the development of high-strength concrete composition, the composition of chemical and mineral additives and the improvement of physical and mechanical properties of high-strength concrete, experimental studies for research, experimental studies dedicated to conducting, using the product obtained in the test-experiment in modern buildings and structures and giving conclusions.

The high level of construction of buildings and structures, especially housing, requires the use of various methods to reduce construction time. This, in turn, led to the widespread use of chemical additives in concrete and mixtures. Depending on the tasks faced by builders, a wide range of chemical additives allows solving narrow problems and using additives with universal capabilities. The use of additives provides economic benefits by reducing energy consumption and saving resources by reducing construction time and improving the quality of the final product.

Modern construction practice involves the extensive use of chemical admixtures in concrete. As

chemical additives, there is no single effective, universal and easy-to-use tool for radically changing the properties of the concrete mixture and concrete. Due to the rapid development of the construction of residential and public buildings with monolithic reinforced concrete structures, there is a constant increase in the volume of use of ready-mixed concrete. New structural systems of buildings, high level of construction in hot and cold periods of the year, monolithic structures made of concrete, including the need to reduce the resource and labor intensity of high-strength construction require a special approach to the selection of chemical additives.

Depending on the number of products included in the supplements, they are divided into single-component and complex. According to the general situation, additives are divided into liquid - F, paste - N, and solid - T types. Chemically, additives are divided into organic and inorganic substances. Depending on the hydrogen indicator (pH value), additives are divided into acidic, neutral and basic. It is known that similar technological effects can be achieved by using different chemicals. In most cases, the following compounds are used as plasticizers:

- ✓ modified lignosulfonates;
- ✓ sulfonated naphthalene formaldehyde compounds;
- ✓ sulfonated melamineformal compounds;
- ✓ modified polycarboxylates or hyperplasticizers.

The effectiveness of hyperplasticizers increases with the strength of concrete.

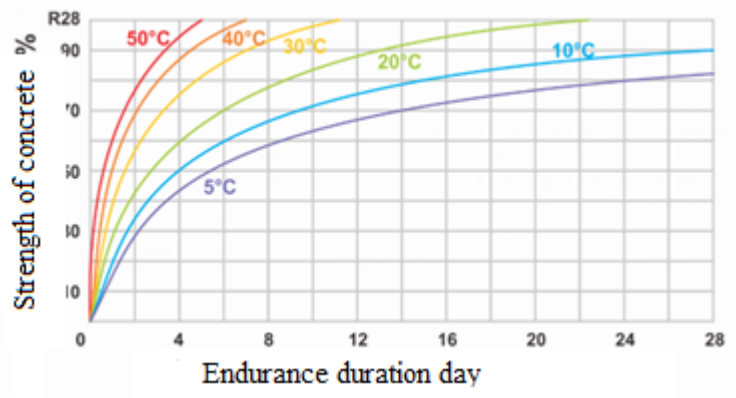
Due to the obvious advantages of hyperplasticizers, their share in the total volume of plasticizers is growing rapidly, especially in developed countries such as Japan, the USA, and Germany. For example, in 2005, the share of hyperplasticizers in the total volume in Japan reached almost 70%.

Polimix X1 405, Supermix CA 330, Chryso 6325, Megaplast PC-08, JK 008, Linamiks PK Tip1, Master Glenium, Mirpolitek, Basf, Asia Element, Millinium and others are widely used in the construction market of Uzbekistan.

In concrete technology, the development of additives that regulate hardening processes in normal and cold climates is of great importance.

Depending on the main effect, chemical additives for concrete are divided into the following types:

- ➢ regulatory properties of concrete mixtures (plasticizing, stabilizing, water retaining, improving delivery of concrete through a concrete pump, regulating maintenance of mobility of concrete mixtures);
- ➢ maintenance of hardening of concrete (retarding and accelerating hardening);
- ➢ increasing the strength and corrosion resistance of reinforced concrete and reinforced concrete, reducing the permeability of concrete (water separation, air intake, gas formation, corrosion of steel reinforcement);
- ➢ special properties for concrete (hydrophobization, antifreeze, polymer);
- ➢ fine dispersion mineral additives (inactive, active, mineral plasticizers);
- ➢ complex additives (complex chemical, organomineral).



Some additives have multi-functional effects, such as plasticizers and entrainment.

Low use of hyperplasticizers hinders the development of concrete technologies.

Various additives are used to regulate the saving properties of concrete, concrete mix and cement. They are divided into two types: chemical additives that are included in concrete in small amounts (0.1-2% mass) and change the properties of the concrete mix and concrete in the right direction, and save cement, at low consumption of cement small mineral additives (5-20% or more) used to obtain dense concrete and increase the strength of concrete.

The use of chemical additives is one of the most versatile, convenient and flexible ways to manage concrete production technology and regulate its properties.

If earlier some chemical products and modified industrial waste were used as additives, now the additives specially prepared for concrete (superplasticizers, organomineral, etc.) prevail.

Development plans of the construction industry envisage a significant expansion of the production of concrete mixtures with the help of effective additives, the use of new types of additives.

Chemical additives are classified according to the main effect:

1) control characteristics of concrete mixtures:

✓ plasticization, i.e. increasing the mobility of the concrete mixture;

✓ stabilizing, i.e. prevention stratification of the concrete mixture;

✓ water retention, reduction of water separation;

2) adjustment of concrete mixtures and hardening of concrete:

✓ accelerator or decelerator,

✓ acceleration of hardening,

✓ providing hardening at cold temperatures (antifreeze);

3) regulation of concrete mix and density of concrete:

✓ taking air, forming gas, foaming.

4) additives-regulators of concrete deformations;

5) increase the protective properties of concrete against steel;

6) additives-stabilizers that increase the durability of concrete mixtures, anti-layer, reduce solution and water;

7) gives special properties to concrete: hydrophobization, i.e. reducing the wetting of concrete, anti-corrosion, i.e. increasing resistance in an aggressive environment, painting, increasing bactericidal and insecticidal properties, electrical insulation, electrical conductivity, anti-radiation.

Some additives have polyfunctional effects, such as plasticizers and air releasers, gas generators and plasticizers, etc.

The effectiveness of the additive's effect on the concrete mixture or concrete is of great importance, which is usually evaluated by the value of the maximum technical effect achieved when adding this additive. Supplements of the same class can vary significantly in effectiveness. In this case, we will consider additional classification into groups with a certain efficiency. For example, additives are divided into four groups according to the effectiveness of plasticizers.

Air admixtures are mainly used to increase the frost resistance of concrete and mixtures. These additives slightly reduce the strength of concrete (1% of air reduces the strength of concrete by 3%), so admixtures that release a large amount of air should not be included in the concrete mix for plasticization. Air content in concrete mix is usually 4-5%.

Calcium chloride, sodium sulfate, nitrite-nitrate-calcium chloride, etc. are used as hardening accelerators. For example, calcium chloride contributes to corrosion, so its content in reinforced concrete is limited to 2%. Sodium sulfate can cause the formation of soils on the surface of structures that require special safety measures. In calcium nitrite-nitrate chloride, the accelerating effect of chloride is combined with the inhibitory effect of calcium nitrate, which reduces the risk of corrosion.

Potassium, sodium chloride, calcium chloride, etc., these additives reduce the freezing point of water and help harden concrete at negative temperatures. The lower the solidification temperature, the higher the amount of additives (up to 10% of cement mass and more).

Complex additives to obtain multi-functional effects, including several components, such as additives, simultaneously plasticize the concrete mixture and accelerate the hardening of concrete, etc. A variety of complex admixtures have been developed that allow effective control of concrete properties and technology. Compound adverbs are conditionally divided into five groups:

- ✓ surfactants (I),
- ✓ surfactants and electrolytes (II),
- ✓ electrolyte mixture (III),
- ✓ complex additives based on superplasticizers (IV),
- ✓ complex multi-component complex additives (V).

Mineral admixtures (MQ) are used along with chemical admixtures to actively control the structure and properties of the concrete mix and concrete. These materials are dusts of various mineral nature obtained from natural or man-made raw materials (ash, soil slag and stones, microsilica, etc.).

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