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The role of chemical and mineral supplements in the development of highly durable concrete structures

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Abstract: Modern construction practice involves the widespread use of chemical additives in concrete. As a chemical additive, there is not a kind of effective, universal and easy-to-use tool for radically changing the properties of concrete mixture and concrete.

Keywords: Housing, chemical, construction, concrete mixture

A high level of construction of premises and structures, especially housing, requires the use of various methods to reduce the construction time. This, in turn, led to the widespread use of chemical additives to concrete and mixtures. Depending on the tasks facing builders, a wide range of chemical additives allows you to solve narrow problems and apply supplements with universal capabilities. The use of additives delivers economic output by reducing energy consumption and saving resources by reducing construction time and increasing final product quality

Modern construction practice involves the widespread use of chemical additives in concrete. As a chemical additive, there is not a kind of effective, universal and easy-to-use tool for radically changing the properties of concrete mixture and concrete. Thanks to the intensive development of the construction of residential and public buildings with monolithic reinforced concrete constructions, constant growth in the volume of ready-made concrete use is observed. New structural systems of buildings, high levels of construction during the warm and cold periods of the year, and the need to reduce the density of monolithic constructions from concrete, including high-powered construction resources and labor, require a special approach to the selection of chemical additives.

Depending on the number of products that are part of the additives, they are divided into one-component and complex. In general, supplements are divided into liquids — F, paste – N, solid-T types. Chemically, supplements are divided into organic and inorganic substances. Depending on the hydrogen indicator (pH value), the additives are divided into acidic, neutral and basic. It is known that similar technological effects can be achieved by the use of various chemicals. In most cases, the following connections are used as plastics:

- lignosulfonatlar o'zgartirilgan;
- sulfonlangan naphthalene formaldeid deposits;
- sulfanlangan melaminformaldeпшв birikmalari;
- modified polycarboxylates or afteriperplatsifiers.

The efficiency of hyperplasticators increases with the strengthening of concrete.

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

Hyperplasticators such as Polimix X1 405, Supermix CA 330, Chryso 6325, Megaplast PC-08, JK 008, Linamiks PK Type1, Master Glenium, Mirpolitek, Basf, Asia Element, Millinium, and so on are widely used in the U.S. construction market.

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

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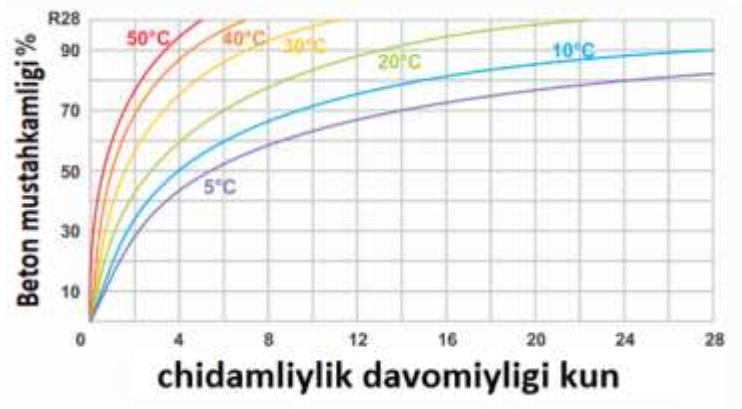
Depending on the main effect, chemical additives for concrete are divided according to the following types:

- regulatory characteristics of concrete mixtures (plasticizing, stabilizing, holding water, improving the delivery of concrete through concrete, regulating the preservation of the mobility of concrete mixtures);
- maintaining the hardening of concrete (slowing and accelerating hardening);
- increase the strength and corrosion resistance of concrete and reinforced concrete, resistance to cold (against water separation, air extraction, gas formation, steel armature corrosion);

- betonga maxsus xususiyats (gidrofobizatsiya, antifreeze, polymer);



- small dispersion mineral supplements (inactive, inactive, mineral plastics);
- complex additives (complex chemical, organomineral).

Some additives have many functional effects, such as plasticizing and airing.
Low use of hyperplastifiers prevents the development of concrete technologies.

Various additives are used to regulate the properties of concrete, concrete mixture and cement savings. They are divided into two types: small mineral supplements (5-20% or more), which are introduced into concrete in small quantities (0.1-2% mass) and save on chemical additives and cement, which change the properties of concrete mixture and concrete in the right direction, obtain dense concrete at low costs of cement, and increase concrete resistance (5-20% or more).

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

If previously the most common in construction, with some chemical products and modified industrial waste used as additive, specially prepared additives for concrete (superplasticators, organomineral etc.) now dominate.

Plans for the development of the construction industry involve significantly expanding the production of concrete mixtures with the help of effective additives, and the use of new types of additives.

Chemical supplements are classified according to the main effects of exposure:

1) Control features of concrete mixtures:
   – plastifikatsiyalash, ya'ni beton aralashmaning harakatchanligini oshirish;
   – stabilizing, i.e. preventing concrete mixture;
   – holding water, reducing water separation;
2) beton qorishmalarni sozlash va betonning qattiqlashishi:
   – accelerator or deceisive,
   – qattiqlashishni tezlashtirish,
   – ensuring hardened temperatures (antifreeze);
3) Arrangement of concrete mixture and density of concrete:
   – get air, form gas, foam.
4) qo'shimchalar concrete deformatsiyalari regulyatorlari;
5) increase the protection of concrete from steel;

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6) Stabilizers that increase the durability of additives-concrete mixtures reduce the solution and water against the layer;

7) Provides concrete with special properties: hydrophobicization, i.e. reducing the moisture of concrete, anti-corrosion, i.e. enhancing resistance in an aggressive environment, increasing dyeing, bactericidal and insecticide properties, electrical insulation, electrical conductivity, anti-radiation.

Some additives have a polyfunctional effect, such as plasticizing and releasing air, generating and plasticizing gas, etc.

The effectiveness of the additive's effect on concrete mix or concrete is of great importance, which is generally estimated at the value of the maximum technical impact achieved when incorporating this additive. The addition of one class can vary significantly in terms of effectiveness. In this case, we will consider additional classification for groups with a particular efficiency. For example, supplements are divided into four groups, according to the efficiency of plastics.

Air additives are mainly used to increase the frost resistance of concrete and mixtures. These additives slightly reduce the strength of the concrete (the volume of 1% of the air reduces the strength of the concrete to 3%), so as not to insert into the concrete mixture to plasticize the additives, which emit a large amount of air. Air composition is usually 4-5% in concrete mixture.

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

These additives, such as potassium, sodium chloride, calcium chloride, etc. reduce the level of freezing of water and contribute to the hardening of concrete at negative temperatures. The lower the burn temperature, the higher the amount of supplements (up to 10% of the cement mass and more).

To obtain multifunctional effects, complex additives, including multiple components such as additives, simultaneously plasticize the concrete mixture and accelerate concrete hardening, etc. Various complex additives have been developed that allow you to effectively manage concrete properties and technology. Advanced additives are conditionally divided into five groups:

- ✓ surfactants (I),
- ✓ surfactants and electrolytes (II),
- ✓ elektrolitlar aralashmasi (III),
- ✓ complex additives based on superplastifiers (IV),
- ✓ complex inserts with complex multi-components (V).

For the active control of the structure and properties of concrete mixture and concrete, mineral supplements (MGs) are used along with chemical additives. These materials are dust of various mineral nature derived from natural or technological raw materials (ash, soil slurries and stones, microcremnezyom, etc.).