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Prospects for the Use of Light Carbonate Slag Carbonate

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Abstract. - Under natural conditions, metallurgical slags do not show hydraulic activity. As a result, granulated finely ground basic metallurgical slags, mostly without hardening activators, are characterized by slow kinetics of strength growth. A significant induction period lasting up to 7 days in a test of normal density, for example, Luhansk slag, followed by a rapid increase in strength and an exponential slowdown, corresponds, as our research shows, to the S-shaped kinetic curve of structure formation. For low-activity slags (Novovasilivsk ferrovanadium slag), the induction period of structure formation lasts for two months. The S-shaped kinetic pattern of strength growth is characteristic of most mineral binders, the hydration products of which are gel-like substances. In some binders (gypsum, HCPV) the induction period is measured in minutes, in others (cements, slag-alkaline binders) - in hours, in others - slags, ashes) - in days. Classic S-shaped curves describe the dependence of crystal mass growth on the time of crystallization at the beginning of formation occurring in gels. The shape of the S-shaped kinetic curves makes it difficult to accurately quantify the duration of the induction period. It should be noted that an increase in temperature will lead to rapid formation of high strength only with the exception of volumetric destruction during steam formation, namely, heating in sealed forms or during hot pressing. These factors have not been examined in previous cross-country studies. Under these conditions, the rate of nucleation reaches maximum values in the early stages of the process. The effective influence of three factors - elevated temperature (t = 100 °C), low W/V ratio (0.14) and high alkalinity (pH = 14.2) - made it possible to obtain samples with a strength of 210 after one hour under the conditions of power pressing MPa. The high values of the activation energy rule out the assumption of diffuse control and indicate that the rate actually reflects the rate of a heterogeneous chemical process. This process is associated either with the rapid formation of precursor compounds or with the deposition in the contact menisci of ready-made framework fragments formed in as a result of condensation-polymerization of precursors from the finest slag particles.

Increased slag dispersion reduces the duration of the induction period due to two reasons - increased solubility of small slag particles and acceleration of accumulation in the interparticle space separated from the surface of gel-like submicroparticles. The entire number of active centers and more soluble mineral relics that come to the surface of the particles creates an optimal partial correspondence and determines the mechanism of cement accumulation of structural units. Due to the fact that the rate of deposition is proportional to the total external surface, with a small filling of slag with highly dispersed "inert" particles in the range of 5-10%, the induction period decreases, despite the lower strength of the filled binder compared to the pure one. Reducing the migration paths of slag averaging products to the contact points of "inert" particles, where the curvature has a negative value, which shortens the time of deposition of the hydrate phase at the introduced crystallization centers.

***Keywords*:** hardening, carbonate slag binders, induction period, hydratation, experiments, silica, complex, low-rise construction, industry.

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