PHYSICAL AND CHEMICAL EVOLUTION STUDY OF CEMENT-SLAG MIXTURE HYDRATION PRODUCTS BY ELECTRON MICROSCOPY ANALYSIS

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The article presents the results of a research work on the use of ground granulated slag as a part of cement substitute. Blast furnace slag is a by-product obtained in the manufacture of pig iron in the blast furnace and, is formed by the combination of earthy constituents of iron ore with limestone flux. When the molten slag is quickly quenched with water in a pond, or cooled with powerful water jets, it forms into a fine, granular, almost fully non-crystalline, glassy form known as granulated slag, having latent hydraulic properties. Such granulated slag, when finely ground and combined with Portland cement, has been found to exhibit excellent cementitious properties [1, 2]. The scanning electron microscopy is an electron diffraction imaging analysis. It allows mapping which gives the sample’s surface image and texture. The SEM analysis enables the verification of the hydration products arrangement in the cement-blast furnace slag mixture structure and also their study in the mortars made of blast furnace slag as partial cement substitutes.

The results show that the microcrystalline hydrated phases architecture is significantly changed with the increase of slag. In the short term, the evolution of hydration reaction becomes slower and in the long term the microstructures becomes more homogeneous, more compact and the interface cement matrix - sand is well structured. The texture of C-S-H (CaO SiO2 nH2O) is fine. This microstructure presents a very low Portlandite Ca(OH)2 content and less ettringite (3CaO.A12O3.3CaSO4.32H2O). This best performance obtained is due to the fact that a part of Ca(OH)2 is combined with granulated slag and participates at the formation of C-S-H.

References