

Abstract:

Title: Analysis of the influence of metallurgical sub-products as aggregates on properties of concrete

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The influence of the use of metallurgical sub-products as aggregates on physical and mechanical properties of concrete is analysed in this work. According to the state of the art developed, the necessity of more research work was checked. Basically, the use of sub-products was focused on road constructions.

The physical, chemical and mechanical properties of all type of aggregates were determined. Four types of metallurgical sub-products were used: chemical foundry sand, green foundry sand (with bentonite), electric arc furnace slag (coarse aggregate) and blast furnace slag (coarse aggregate). The calcareous aggregates were used as fine and coarse raw aggregates.

Three experimental stages of concrete production were carried out. In each stage, nine type of concretes were produced in each : Conventional concrete (HC), concrete made with chemical foundry sand (HFQ), concrete made with green foundry sand (HFV), concrete made with electric arch furnace slag as coarse aggregates in 25%, 50% and 100% in substitution of raw coarse aggregates (HHE25, HHE50 and HHE100). And concrete made with blast furnace slag as coarse aggregates in 25%, 50% and 100% in substitution of raw coarse aggregates (HHA25, HHA50 and HHA100). The effective water/cement ratio of 0.55, 0.5 and 0.52 were used for all concrete productions in stage 1, stage 2 and stage 3, respectively.

Compression strength, splitting tensile strength and modulus elasticity were determined in stage 1, and stage 2. The compressive residual strength after high temperature exposure and sorptivity of all concretes were also determined in stage 2.

On the stage 3, compression strength, sorptivity and shrinkage of each concrete were determined. This stage will be completed with experimental (permeability, thermic shock, and chloride diffusion) carry out in Aidico and Intromac technological centers.

The conclusions obtained can be described as: The properties of metallurgical sub-products are acceptable to be used as aggregates for concrete production. The concrete made with chemical foundry sand had better properties than concrete made with green foundry sand. HFQ had better properties than HC when the concretes were produce with low effective w/c ratio. The concretes made with electric arc furnace slag and concrete made with blast furnace slag had similar compression and splitting tensile strength than conventional concrete when concretes were made high water/cement ratio. At low w/c ratio those concretes had higher compression than conventional concrete. The modulus elasticity of HC was always higher than any other concrete. The residual compression strength of concrete made with metallurgical sub-products was higher than that on HC. Concrete produced with blast furnace slag had the lower sorptivity.