



Euroslag Publication No 8
ISSN 1617-5867

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9th European Slag Conference

“Circular Economy in the Slag Industry – reliable Products – reduced Costs”

October 11th – 13th, 2017, Metz, France

Proceedings

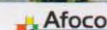
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EUROSLAG

The European Association representing
metallurgical slag producers and processors





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A COMPARISON BETWEEN EUROPEAN ELECTRIC ARC FURNACE SLAGS

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Abstract

The European Union is supporting the transition towards a more circular economy. Waste management is one of the main points in the circular economy. In this way, the steelmaking industry generates huge amounts of waste. In Spain and Italy most of the produced steel is manufactured in electric arc furnaces (EAF), so the main waste resulting from this industry are EAF slags. Several researchers have studied their use in hydraulic mixes, mortar and concrete, showing that their mechanical properties and durability are similar to mixes manufactured with natural aggregates, or even better. In spite of these promising results, still few producers allow this by-product to be applied in real construction works, because of a lack of reliable standards.

For the standardization of slag use in civil engineering applications, it is necessary to gain further knowledge about the physical and chemical properties of EAF slag, and its influence in the properties of hydraulic mixes. Accordingly, this research aims to study in detail chemical and physical properties of black (oxidizing) slag, coming from different sites both in Spain and Italy. Additionally, the performances of concretes manufactured with these slags are compared, showing the influence of slag properties on concrete behavior.

previously [12] that an excessive presence of iron oxides has detrimental effect in the strength of the concretes.

Concerning strength evolution in time, it is worth to note that a similar trend is observed between the concretes manufactured both in Italy than in Spain, despite the slag type: for the low-strength concretes, $f_{c,7days}$ ranges between 88% and 90% of the $f_{c,28days}$. Conversely, for the high strength concretes, $f_{c,7days}$ ranges between 94% and 95% of the $f_{c,28days}$.

Concerning the elastic properties of the concretes, is difficult to do a comparison being sure that the unique factor that influences this parameter are the properties of the slag because of the additional influence of air occluded. As a result, the Spanish concretes shows slightly higher elastic modulus than the Italian concretes.

5. Conclusions

The following conclusions may be drawn from the results obtained in this study:

- The steelmaking process has a great influence in the properties of the slag, which remains in some properties of the concrete mixes.
- In spite of the different properties of the slag that can influence the properties of the final concrete, there are other factors that have higher influence in the mechanical properties of the concrete, as it has been shown (e.g. occluded air effect).

The results of the high amount of researches that have been developed about the use of EAF slag as aggregate in concretes, should be enough to encourage the governments for the standardization of this by product. Nevertheless, further researches about the expansive compounds of the slag and the influence of its properties on the mechanical and durability properties of the concrete are necessary.

Acknowledgment

We express our gratitude to the Basque Regional Government (IT781-13 Research Group), to the FEDER Funds and Spanish Ministry (MINECO) project BIA2014-55576-C2-2-R and to the Vice-Rectorate of Investigation of the University of the Basque Country (UPV/EHU) for grant PIF 2013 and the grant for mobility of researchers 2015, for financing this research work.