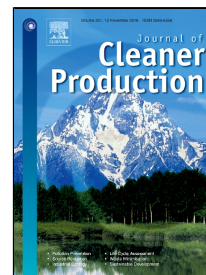


# Accepted Manuscript

Dimensional stability of Electric Arc Furnace slag in civil engineering applications

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## 14 Highlights

- 15 • Swelling of EAF slag due to free CaO hydroxilation is experimentally investigated.
- 16 • EAF slag surface enriches of calcite after weathering.
- 17 • Open porosity is reduced after weathering, improving slag properties.
- 18 • Limits for maximum allowable slag swelling are provided for some applications.

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## 20 Abstract

21 Dimensional stability of manufactured aggregates represents a matter of interest for many  
22 applications in civil engineering. Past results evidenced how steel slag might be affected by potential  
23 swelling, due to several concurring causes linked to the presence of free lime and periclase in their  
24 chemical composition. In this work, a detailed analysis about physical and chemical properties of  
25 Electric Arc Furnace slag (EAFS) is developed, using thermogravimetry, scanning electron  
26 microscopy, X-ray diffraction and porosity analysis. The efficiency of a commonly used method for  
27 slag treatment on reducing its swelling-potential is also experimentally assessed and confirmed,  
28 through expansion tests carried out in an experimental apparatus developed specifically for this  
29 scope, based on steam diffusion within the test sample. Lastly, a maximum allowable limit for slag  
30 swelling is proposed for some applications of interest.

31

## 32 Keywords

33 EAF slag; constructions; expansion; manufactured aggregates; microstructural analysis; recycling.

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## 35 1. Introduction

36 Iron and steelmaking industry is a very important activity for the economies all over the world.  
37 However, it consumes a large amount of raw materials and energy, and yields a large amount of  
38 waste, among which slags are the most abundant. In Southern Europe, the most common way for  
39 manufacturing steel is through the Electric Arc Furnace (EAF) technology; more than 40% of steel  
40 produced in Europe in this type of furnace is manufactured in Italy and Spain (Worldsteel association,  
41 2015), and hence huge amount of Electric Arc Furnace Slag (EAFS) should be managed in these  
42 countries. Steel slags are formed from added fluxes, iron oxides and impurities of iron and steel

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