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RECYCLING OF METALLURGICAL WASTE (SLAG), LOW GRADE BAUXITE AND OVERBURDEN EXCAVATION LIMESTONES IN THE PRODUCTION OF HIGH QUALITY ALUMINA CEMENT

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EXTENDED ABSTRACT

The reduction smelting of low grade nickel ferrous lateritic ores of Greece in LARCO's **E**lectro **R**eduction **F**urnaces (ERF) is related with the production of 20t of slag per ton of FeNi (15% Ni). The annual slag output in LARCO is about 1.8-2.0 million tones. 80% of the slag is cast off in the N.Euboian Gulf, with consequent encumbrance of the underwater landscape with an inert slag containing metals such as nickel, iron, chromium and cobalt. The rest 20% of the ERF slag is industrially used in the cement production and for sandblasting. However, the increased industrial productions during the last years and at the same time the implementation of new environmental legislation, forces LARCO to find either new applications or better disposal solutions for the ERF slag.

The direct use of this slag in the slag-cement production is not possible, due to it's high contents in iron and silicon oxides, 42 and 35%, respectively and the absence of latent hydraulic properties. The reduction smelting of slag's mixtures with low-grade bauxite and overburden excavation limestone can lead to the production of **H**igh **A**lumina **C**ement (HAC) that has a commercial value 4-5 times more than the typical Portland Cements.

The above-mentioned process was firstly studied through thermo chemical calculations, concerning the investigated system. Experimental work for the production of HAC from the mixture of the raw materials followed in laboratory scale, where the slag usage was in the range of 12-16%. The study of the final products, concerning the compressive strength development, showed that the production of high alumina cements is feasible. Based on the laboratory scale results, five pilot scale trials were carried out in a 5t EAF, and led to the production of special types of HAC, with strength development similar to that of the commercial HAC types.

The evaluation of the proposed process has proven that the production of HAC from indigenous raw materials and wastes is feasible. This R&D work showed that the utilization of ERF slag waste for the production of high added value material, as HAC, is accomplishable, with the implying environmental benefit from the deduction of the cast-off in the N.Euboian gulf. The total process is characterized by the absence of by products as, apart from the HAC, the produced metal can be used in steel making, since it contains the recovered nickel, chromium and iron from slag and bauxite (zero residues process).

Key words: ferronickel, ERF slag, high alumina cement, reduction smelting, diasporic bauxite, zero residues process