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THE TREATMENT AND MINIMIZATION OF METALLURGICAL SLAG AS WASTE

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Abstract

The slags are an important waste and by-products of metallurgical industry. The present paper summarizes results obtained from physical and chemical analyses on metallurgical slag provided from S.C. "Mittal Steel Galati" S.A. The physical structure and gradation of granulated slag depend on the chemical composition of the slag, its temperature at the time of water quenching, and the method of production. The following mineralogical components were noticed through bypowder X-ray diffraction analysis (XRD) and the chemical analysis of metallurgical slag: cristobalite (SiO_2); gehlenite ($2CaO•Al_2O_3•SiO_2$); corundum (Al_2O_3); sillimanite ($Al_2O_3•SiO_2$); pyrope ($3MgO•Al_2O_3•3SiO_2$); dicalcic ferrite; calcium orthosilicate. It is very important to analyze the content of the free calcium oxide and free magnesium oxide. The chemical reaction between blast furnace slag and water is slow, but it is greatly enhanced by the presence of free calcium oxide and free magnesium oxide getting on calcium and magnesium hydroxide which would make the aggregates obtained through slag processing disintegrates. These alkalis can modify the mechanical properties of slag. The elimination of this problem is effected through controlled cooling of the slag and through its aging, meaning, and the continuous watering of it. Blast furnace slag is mildly alkaline and exhibits a pH in solution in the range of 10 to 12. Processed slag exhibits favorable mechanical properties for aggregate use including good abrasion resistance, and high bearing strength. By our assessments it was proved that the blast furnace slag from S.C. "Mittal Steel Galati" S.A. have comparable properties of granite. The presence of Fe (+2) and Fe (+3) →Fe (total) oxides in the metallurgical slag composition makes its gross density be greater thus being possible to compare it to natural rocks. During the determination of the resistance to frost-defrost (chemically and physico-mechanically) very similar values were obtained through both processes due to the slow cooling process of metallurgical slag and implicitly to the formation of its crystalline structure.

Key words: abrasion resistance, aggregates, blast furnace slag, chemical properties, physico-mechanical properties, XRD analysis

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