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RESEARCHES ABOUT THE CHARACTERIZATION OF METALLURGICAL SLAGS FOR LANDFILLED WASTES MINIMIZATION

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Abstract

The aim of this paper is to assess the chemical and mineralogical composition and the leaching behavior of the electric arc furnace slags (EAFS) in order to improve their management by identifying suitable reuse options in different fields. The chemical and mineralogical composition of slag varies from one type of steel to another, from one technological stage to another and from one steel plant to another. In order to minimize the slag quantities disposed in the slag dumps one has first to characterize the generated slags for each technological stage of the steelmaking process. The chemical composition, as percentages, of the compounds identified in melting, refining and deoxidizing slags characterized varies between: (27-50%) for calcium oxide (CaO), (15-25%) for silicon dioxide (SiO_2), (8-30%) for total iron (Fe tot.), (3-10%) for manganese oxide (MnO), (5-8%) for magnesia oxide (MgO), (5-6%) for alumina (Al_2O_3) and (0.1-0.4%) for phosphorus pentoxide (P_2O_5). As a result of the mineralogical characterization of the slag samples there were identified the following mineralogical compounds: jacobsite ($MnFe_2O_4$), wustite (FeO), magnetite (Fe_3O_4), hematite (Fe_2O_3), grossular ($(Ca_{2.869}Fe_{0.131})(Al_{1.89}Fe_{0.11})(SiO_4)_3$), andradite ($Ca_3Fe_2(SiO_4)_3$), pyrope ($(Mg_{0.92}Fe_{0.05}Ca_{0.03})_3Al_2SiO_4$), akermanite ($Ca_2Mg(Si_2O_7)$), fayalite manganoan magnesian ($Mg_{.075}Fe_{1.741}Mn_{.123}SiO_4$), srebrodolskite ($CaFeO_4$), grossularite ($Ca_3Al_2(SiO_4)_3$), gehlenite ($Ca_2Al_2SiO_7$), merwinite ($Ca_3Mg(SiO_4)_2$), Fe - ringwoodite ($Fe_2(SiO_4)$), monticellite ($CaMg(SiO_4)$) and fayalite – tephorite ($FeMn(SiO_4)$). The slags can be used in different fields without any risk of harmful impact on the environment due to heavy metal leaching. The whole usage of slag would result in the conservation of natural resources and the elimination of the environmental problems with final disposal.

Key words: electric arc furnace, metallurgical waste, pollution, slag, steelmaking

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