Effects of slag basicity and B_2O_3 contenton theviscosity of $CaO\text{-}SiO_2\text{-}B_2O_3\text{-}25\%Al_2O_3\text{-}8\%MgO$ oxide system

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Abstract
A simplex-lattice method of experiment planning that allows obtaining mathematical models describing the dependence of the property on composition as a continuous function was used to study the effect of basicity and B_2O_3 content in slag on the viscosity of the $CaO\text{-}SiO_2\text{-}B_2O_3$ oxide system containing 25% Al_2O_3 and 8% MgO. Mathematical models describing the relationship between the temperature of a given viscosity and the composition of the oxide system were constructed using experimental data. Then the set of viscosity isolines was obtained by combining the obtained composition-temperature diagrams of a given viscosity by the isothermal section of the composition-viscosity diagram. The generalization of the results presented in the form of composition-property diagrams allowed to quantify the effect of slag basicity and the B_2O_3 content on the viscosity of the resulting oxide system. The viscosity of slag basicity 2.0-2.5, containing 7-10% B_2O_3 does not exceed 4 Ps at a temperature of 1400 ^{o}C. The displacement of slags in the region of increased to 3-5 basicities is accompanied by an increase in the viscosity of slags to 12 Ps while the content of B_2O_3 is reduced to 2-6%. An increase in temperature to 1450 ^{o}C leads to a significant decrease in slags viscosity, which in the basicity range 2-3, even at a B_2O_3 content of 4%, does not exceed 4 Ps and increases to 6 Ps in basicity 3-5 and a content of B_2O_3 not more than 3%. The slag viscosity in the basicity range 2-5 varies within 2-4 Ps at a B_2O_3 content of 1-4% at a temperature of 1500 ^{o}C. It has been established that slags in the basic 2-5 range containing 1-10% B_2O_3 are characterized at constant concentrations of Al_2O_3 (25%) and MgO (8%) with a high liquid mobility, whose viscosity in the temperature range 1450-1500 ^{o}C does not exceed 4-6 Ps. Such slags have, as a rule, high refining properties and can be recommended for the formation on the ladle furnace.

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