Use of the Oxide Database in Modeling of Multi-Component Slag Viscosities

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ABSTRACT

Based on the thermodynamic associate species database, a modified Arrhenius viscosity model is developed for the system SiO_2-Al_2O_3-CaO-MgO-Na_2O-K_2O. The model can link the internal structure of molten slags to the viscosity through the associate species distribution.

As a result, the model is capable of predicting the viscosity over a wide range of temperature and composition by using only one set of model parameters, all of which have clear physico-chemical meaning.

By using this structurally-based viscosity model, both challenges of the viscosity behaviours, the so called lubricant effect as well as the amphoteric or charge compensation effect, can be described very well.

Furthermore, it can present the different roles of network modifiers CaO, MgO, Na_2O and K_2O on viscosity of the SiO_2-based binary systems. At the same time, it is effective to display the priority of different metal ions to bond with aluminum ion concerning the compensation effect.