ISOVISCOSITY COURVES FOR $CaO-SiO_2-Al_2O_3-MgO$ STEELMAKING SLAGS AT 1500 °C

Augusto Lachini Pereira[1]

Vinicius Cardoso da Rocha[1]

Wagner Viana Bielefeldt[1]

Antônio Cezar Faria Vilela[1]

[1] *Metallurgical Engineering, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil.*

Abstract:

Viscosity is one of the most important physical properties regarding refining steelmaking slags and it is influenced even by minor changes in their chemical composition and temperature. Optimizing these parameters may affect the reactions between slag and liquid steel, promoting relevant effects in terms of the steel quality, specially its cleanliness. The viscosity measurement process is considered expensive, so the cost-effectiveness does not favor the measures at high-temperatures. Alternatively, it is possible to apply mathematical models or thermodynamic softwares to obtain viscosities for a given range of chemical composition and temperature of slags. In this context, this present paper proposes an accurate viscosity representation model, using isoviscosity courves, applied for secondary steelmaking slags, covering the CaO-SiO2-Al2O3-MgO (CSAM) system at 1500 ºC. The viscosity representation fields include fully liquid and an partially liquid slags in the CSAM system. The viscosities were calculated using the FactSage 7.2 (for Liquid Phase) and the Roscoe-Einstein equation (for Phase Mixture) for a total of 5976 slag compositions at 1500 ºC, covering the composition ranges: 0–80 wt.% SiO2, 0–77 wt.% Al2O3, 0–100 wt.% CaO and 0–15 wt.% MgO. Part of these compositions are in the fully liquid region of the CSAM diagram, another part includes the region with solid + liquid fractions, gaining greater application and arousing industrial steelmaking interest, being commonly used for the refining of special steels. The calculated viscosities were compared with experimental data, in order to evaluate the accuracy of the models used. The preliminary results indicated that there is a great convergence between the calculated and experimental viscosities data, promoting an efficient approximation of the isoviscosity courves for the CSAM slag system at 1500 ºC.