OXYGEN ACTIVITY MEASUREMENTS IN SIMULATED CONVERTED MATTE

By

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ABSTRACT

Measurements of oxygen activities in a matte at high-temperature could be useful to determine and control the repartition of different elements, such as iron, copper, and nickel between the oxidised phase, (the slag) and the sulphide phase, (the matte). Electrochemical measurement of oxygen partial pressure in equilibrium with the melt can be performed by using solid electrolytes such as the zirconia solid electrolyte.

The oxygen measurements in Cu-Ni-Fe-S matte were studied experimentally by measuring the partial pressure of oxygen through the EMF, using a silica-saturated slag and either a CO-CO_2-SO_2 gas mixture or Ar gas, at 1250^{o}C. The calculated equilibrium oxygen partial pressure varied from 1.53×10^{-8} to 2.64×10^{-7}atm. Oxygen measurements were conducted by using fully stabilized zirconia as solid electrolyte. Two different solid reference electrodes were used: Cr/Cr_2O_3 and Fe/FeO. EMF measurements obtained with Cr/Cr_2O_3 solid reference electrode were less stable and accurate compared to those with Fe/FeO solid reference electrode. Therefore, EMF measurements on oxygen concentration point out that the Fe/FeO is more suitable solid reference electrode for this application than Cr/Cr_2O_3.

Analyses were obtained using the SEM, (scanning electron microscope) and the electron probe microanalyser.

The measured oxygen concentration was found to be sensitive to the iron content in the matte.

KEYWORDS: Activity, matte, slag, solid electrolyte.

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