Effect of the Cooling Rate on the Phase Composition and Structure of Copper Matte Converting Slags

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Received February 20, 2009

Abstract—The effect of the cooling rate on the phase composition and microstructure of copper matte converting slags is studied by X-ray diffraction, combined thermogravimetry and calorimetry, mineragraphy, and electron-probe microanalysis. The compositions of oxide and sulfide phases are determined, and the forms of nonferrous metals in slags cooled at a rate of 0.3 and 900°C/s are revealed. At high cooling rates of the slags, iron silicate glass is shown to form apart from sulfide phases. Repeated heating of the slags leads to the development of devitrification, "cold" crystallization, and melting. A decrease in the cooling rate favors an increase in the grain sizes in oxides (magnetite, iron silicates) and sulfides (bornite-, sphalerite, and galena-based solid solutions).

PACS numbers: 64.60.-i, 81.30.Dz

DOI: 10.1134/S0036029509040028