Cold Simulation of Metalloids Transport in Blast Furnaces

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Metalloids normally get transferred at the interface of metal droplets passing through the slag system in the dropping zone and at the slag-metal interface in the hearth zone in the lower region of a blast furnace. In these high temperature processes, the mass transport being the rate-controlling factor, the viscosity of the slag system determines the kinetics of the refining reactions accompanied by mass and heat transfer at the metal droplets and slag interface. Slag systems generally possess random network structures comprising internal regions of weak ordering. The presence of these regions may result in non-Newtonian behaviour of the slag. The rheological characteristics of a fluid relating to its network structure is expressed in terms of the indices consistency (k') and flow behaviour (n').
The extent of metalloids presence in hot metal is subjected to their residence time at the slag-metal interface. The metal droplet descent through a surrounding fluid system has been studied and a co-relation between drag Reynolds number and modified Reynolds number has been obtained. This correlation has been used to determine the drag velocity of a metal droplet falling through a slag system and the residence time distribution (RTD) of the metalloids at the slag-metal interface in the lower region of the blast furnace.