Dynamic model of a TSL furnace, developed with SimuSage^{TM} software

RF van Schalkwyk[(a)], Prof. Dr.-Ing. M. Stelter[(b)], Dr. J. Rezende[(c)], Dr. M. to Baben[(c)], Prof. Dr. Dr. h.c. mult. M.A. Reuter[(a)]

(a) Helmholtz Institute Freiberg for Resource Technology
(b) TU Bergakademie Freiberg
(c) GTT Technologies

Abstract

A dynamic model was developed in SimuSage^{TM}, of a Top Submerged Lance (TSL) furnace. The objective is to create a tool for optimising smelting of complex feed materials. Thermodynamic equilibrium models (e.g. created from FactSage), or laboratory measurements can be used to estimate the distributions of elements between phases. However, mass transfer processes are probably controlling in a TSL. The Connected Local Equilibria (CLE) method was used to create a dynamic model. The furnace is divided into a number of zones, e.g. a slag zone, metal zone etc. Equilibrium is calculated in each zone (by means of Gibbs Energy Minimisation), but the system is dynamic because mass transfer can take place between the zones. The benefit of this method is that dynamic results can be estimated for a large number of elements, for which fundamental kinetic parameters at the relevant operating conditions are often not available. The model has been tested against published results from lead laboratory experiments and industry results for copper matte smelting.