Dynamic Simulation of Batch Copper Converting Using SysCAD with ChemApp

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Production of primary copper from sulfide ores by pyrometallurgical route involves smelting, converting, and refining, followed by electrowinning or casting of fire-refined copper as final product. The converting step, which involves producing liquid blister copper by removing Fe and S from the molten matte, is typically and mainly carried out by Peirce-Smith Converting process. This batch process is the focus of the model presented herein. Depending on the matte grade produced by the smelting process, two distinctive steps or "blows" are required during converting; these are: slag blows, where most of the Fe in matte is oxidized and transfer to slag with the addition of silica flux, and Cu blow, where S is removed from white metal to produce blister Cu. SysCAD with ChemApp was used to develop a dynamic model of this process, capturing its batch nature as well as the complex thermochemistry involved in this system (Cu matte and metal, slag, spinel, etc.). The combination of highly advanced thermodynamic calculation engine such as ChemApp, thermodynamic input file and system description, and the flexibility and robust dynamic simulation capabilities of SysCAD, allow exploration and evaluation of several practical aspects and issues related to the converting process that would be difficult to achieve by a steady-state simulation approach.