

Modelling of submerged plasma slag fuming process in FactSage

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Abstract

The zinc-containing slags from lead blast furnace and copper smelter are treated using a slag fuming process, where heavy volatile metals such as zinc and lead are recovered by reduction and evaporation from the molten slag bath. However, the traditional slag fuming technologies use a significant amount of fossil fuel as energy source and reductant, thereby emitting a considerable amount of greenhouse gases. Furthermore, the manoeuvrability of the process is limited due to the limited workable range of air and fuel ratio. However, if the fossil fuel burners are replaced with electrically powered non-transferred arc plasma torches as an energy source, the overall carbon usage of the process can be reduced significantly. Additionally, the high plasma temperature and the ability to control the atmosphere inside the reactor enables the process to produce higher output.

A dynamic steady state thermodynamic flowsheet model of the submerged plasma slag fuming process has been developed in FactSage 7.0 based on Metallo Belgium's industrial-scale submerged plasma slag fuming furnace. This model describes the chemical reactions, phase equilibria and heat transfer in each sub-unit operation, and the heat and mass transfer between the subsequent sub-unit operations of the slag fuming process. The model was validated on several process batches.

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