

Minor Elements in Copper Converting

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ABSTRACT

The raw materials treated in non-ferrous processes are often very complex. Besides the main elements like copper, iron, sulphur, oxygen and silicon also minor elements like lead, zinc, arsenic, antimony and bismuth can be present.

The minor elements originate both from the ores and from secondary material, such as waste electric and electronic equipment (WEEE), treated at a smelter plant. The content of impurities can reach several weight per cent and good impurity elimination during smelting and converting is therefore necessary to ensure specified levels of the refinery.

At Boliden Mineral ABs smelter plant Rönnskärsverken in Sweden, the Kaldo furnace is used in the recycling of WEEE. The scrap is melted in the Kaldo furnace generating a copper rich metallic alloy (referred to as black copper) and a slag phase. The black copper is transferred in liquid form to the Peirce-Smith Converter in the copper smelter for recovery of valuable metals.

The influence of the material streams originating from melting of scrap in the Kaldo furnace on the PS converter process is predicted using a non-equilibrium model. The model realised in SimuSage is expanded to include Bi and Sb, for the prediction of distribution and elimination of the minor elements, by using dilute solutes.

The simulation result shows that an addition of black copper decreases the volatilisation of Bi and Sb. For instance, by adding black copper in the middle of the second slag blow lower the elimination of Bi to the gas phase from 96% to 87% of the total amount of Bi.

A higher copper grade of the matte is also negative for the elimination of Bi and Sb. The results are approximate due to the use of dilute solutes. A more thorough assessment of Bi and Sb for the present system is needed.