34) Russian Journal of Non-Ferrous Metals

Volume 60, Issue 3, 1 May 2019, Pages 259-267

Investigation into the Possibility of Reducing Carbon Dioxide Emissions during the Waelz Process of the Oxidized Zinc-Containing Material(Article)

Shumskiy, V.A.a, Kulenova, N.A.b, Onalbayeva, Z.S.b, Akhmetvaliyeva, Z.M.b, Mamyachenkov, S.V.c View Correspondence (jump link)

aEastern Research Mining and Metallurgical Institute of Nonferrous Metals, Ust'-Kamenogorsk, 070002, Kazakhstan

bEast Kazakhstan State Technical University, Ust'-Kamenogorsk, 070002, Kazakhstan

cUral Federal University, Yekaterinburg, 620002, Russian Federation

Краткое описание Просмотр пристатейных ссылок (26)

Abstract: The results of model studies on the possibility of reducing energy costs and carbon dioxide emissions during the Waelz process of oxidized zinc-containing material are presented. Herewith, the METSIM specialized software product is used. It is well-known in the world practice of metallurgical processes and manufactures modeling and makes it possible to analyze the influence of the variation in the process modes on the final process results. Model calculations show that the largest decrease in consumption of energy carriers and CO2 emissions are observed when using air blast heated to 200°C with an increase in its flow rate from 1000 to 7000 ncm/h and an accompanying decrease in atmospheric air suction. The calculated reduction of the specific carbon consumption and CO2 emissions is 30.2–35.5%, and that of the total specific consumption of energy carriers is 28–32%. Herewith, blast heating to 200°C in the air heater of the waste-heat boiler does not require additional energy inputs in contrast with the variant of using the oxygen blast with electricity consumption for oxygen production. The intensification of the Waelz process with the application of the additional oxygen blast (or enrichment of the air blast with oxygen) and the heated air blast supply with an accompanying decrease in the atmospheric air suction leads not only to a decrease in the specific flow rate of the carbon energy carrier, but also to an increase in the degree of the carbon utilization. The maximal calculated increase in the degree of carbon utilization is 6.2 rel. %—from 60.3% when using cold air blast without oxygen to 66.5% using the air–oxygen blast heated to 200°C (7000 ncm/h of air and 185 ncm/h of oxygen) without atmospheric air suction. Maintaining the optimal redox and thermal process modes requires correctly controlling the kiln blow-out mode allowing for the atmospheric air suction in the kiln unloading head. Uncoordinated variations in specific consumptions of the charge, carbon, blast, and rarefaction in the dust chamber lead to an accompanying decrease in the zinc recovery into sublimates and an increase in its losses with clinker. 