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不锈钢冶炼粉尘中锌还原的研究

彭 兵[1,2], 张传福[1], 彭 及[1], 柴立元[1], 陈为亮1, Jonathan Lobel[2], Janusz A. Kozinski[2]

(1·中南大学冶金科学与工程学院,湖南长沙 410083;
2·Department ofMetallurgical Engineering, McGill University,
3610 University Street, Montreal, QC, Canada, H3A 2B2)

摘 要：直接还原回收有价金属处理不锈钢冶炼粉尘过程中,锌在冶炼系统中不断循环积聚,可从收尘系统中分离出 高含锌粉尘,然后采用CO在等离子炉中选择性还原回收锌.作者研究了反应温度、粉尘给料速度、粉尘给料量与还原剂CO量比等对锌还原挥发率的影响,建立了还原过程的数学模型.研究结果表明:还原温度对粉尘中锌的还原影响很大,升高温度有利于锌的还原,但当温度超过1 228.2℃时,进一步升高温度不会明显提高锌的还原率,高的锌还原率的获得还应通过降低给料速度和控制给料比来实现;在1 400℃,给料速度为50 g/min,给料比为4·5∶1时,锌还原率可达99·98%;ZnFe204在高温下可分解,在还原过程进行前将粉尘中$ZnFe_2O_4$分解可显著提高锌的还原挥发率.

关键字：氧化锌;还原;冶炼粉尘

Reduction of zinc oxide in EAF dust by carbon monoxide

PENG Bing[1,2],ZHANG Chuan-fu[1],PENG Ji[1],CHAI Li-yuan[1],
CHENWei-liang[1],Jonathan Lobel[2],Janusz A. Kozinski[2]

(1.College of Metallurgical Science and Engineering, Central South University, Changsha 410083, China;
2.Department of Metallurgical Engineering, McGill University, 3610 University Street, Montreal, QC, Canada H3A 2B2)

Abstract: Electric arc furnace (EAF) steelmaking flue dust is classified as a hazardous waste because it has higher than acceptable heavy metal leachabilities such as zinc, lead, cadmium and chromium, so that it is banned from landfills in many countries. In addition to being an environmental hazard, the flue dust is also an economical concern to stainless steelmakers as it contains large amounts of valuable alloying elements, especially for iron, chromium and nickel. A new technology of direct recycling of EAF stainless steel dust was developed to recover the metals from the dust. The zinc rich dust was separated from the dust-collecting chamber and then reduced by CO in the plasma furnace. The effects of the operating parameters such as temperature, dust feed rate and the ratio of dust to CO on the reduction of zinc oxides in the dust were investigated. The mathematics model for the reduction process was set up based on the experimental research .According to the mathematics model, the temperature has obvious effect on the reduction of zinc. It is benefit to the process of zinc reduction to increase the temperature. But the temperature will not be the main factor for the reduction process after 1 228.2℃, to decrease the dust feed rate and to control the ratio of dust to CO will promote zinc reduction .When the dust feed rate is 50 g/min, the dust to CO is 4.5∶1, at 1 400℃, the recovery of zinc can reach 99.98%.It was

also found from the experiments that $ZnFe_2O_4$ in the dust could be decomposed at high temperature. Decomposing $ZnFe_2O_4$ in the dust increases the recovery of zinc from the dust distinctly.

Key words:zinc oxide; reduction; EAF dust

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