Contribution ID: **127** Type: 口头报告

铜渣冷却过程中铜锍生长机理及重金属转化行为研究

摘要

通过缓慢冷却、破碎、研磨和浮选，可以有效地从铜渣中回收铜。然而，缓慢冷却对铜锍生长的影响机制仍不清楚。本文探究了熔融铜渣冷却过程中铜锍的生长机理及铜、铅和锌的转化行为。结果表明，熔融铜渣处于高温非平衡状态，缓慢冷却可促进非平衡相向平衡相的转变。缓慢冷却促进了 Cu2O 和 PbSiO3 分别转化为 Cu2S 和 PbS，以及掺锌尖晶石（Fe3-xZnxO4）和掺锌铁橄榄石（Fe2-xZnxSiO4）的形成。冷却过程中，溶解铜在原先存在的铜锍液滴表面析出并生长。与此同时，溶解铜优先在高熔点的 Fe3O4 表面异相形核和生长，其次是熔点较低的 Fe2SiO4。缓慢冷却增加了溶解铜的形核和生长时间，这有利于铜锍颗粒的生长，从而提高铜的浮选回收率。这些发现有助于指导改进铜渣缓慢浮选工艺，提高重金属回收率，从而减少铜渣的累积量。

关键词

铜渣；缓慢冷却；铜锍生长机理；重金属回收

Abstract

Copper (Cu) can be effectively recovered from copper slag by slow cooling, crushing, grinding, and flotation. However, the mechanism by which slow cooling affects the growth of copper matte remains unclear. This study investigated the mechanism of matte growth and the transformation behaviors of Cu, Pb, and Zn during the cooling process of the molten copper slag. It is shown that the molten copper slag is in a high-temperature non-equilibrium state and that slow cooling encourages the transition from the non-equilibrium to the equilibrium phase. The conversion of Cu2O and PbSiO3 into Cu2S and PbS, respectively, as well as the formation of Zn-doped spinel (Fe3-xZnxO4) and Zn-doped fayalite (Fe2-xZnxSiO4), were facilitated by slow cooling. The dissolved Cu precipitated and grew on the surface of the pre-existing copper matte droplets during the cooling process. In addition, the dissolved Cu preferentially heterogeneously nucleates and grows on the surfaces of the high melting Fe3O4, followed by Fe2SiO4 with a lower melting. Slow cooling increased the nucleation and growth time of dissolved Cu. It benefits the growth of copper matte particles, thereby improving the Cu flotation recovery. Moreover, the toxic leaching concentration of the flotation tailing was shown to be below the standard limits by the toxicity characteristic leaching procedure. These findings could aid in the recovery of heavy metals from copper slag employing slow cooling and flotation, thereby lowering copper slag accumulation and mitigating environmental hazards.

Keywords

Copper slag; Slow cooling; Matte growth mechanism; Heavy metals recovery

Authors: 匡, 彪 (昆明理工大学); 胡, 建杭; 于, 勇

Presenter: 匡, 彪 (昆明理工大学)

Session Classification: 环、化、材、技、能源战略

Track Classification: 03 口头报告: 环、化、材、技、能源战略