Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19603

Hydrometallurgical process for selective recovery of copper and zinc from the fine fraction of municipal solid waste incineration bottom ashes

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In Europe in 2019, around 245 Mt of MSW were produced, a part is intended for incineration which produces each year 20 Mt of Incineration Bottom Ashes (IBA)[1]. The finest fraction (<2mm) represents 30wt% of IBA and couldn't be reemployed. The aim of the project is the valorization of this fine fraction by mineral and metals recovery. Based on the chemical analysis of the raw fine fraction of IBA, a four-criterion methodology is applied which allowed the identification of copper and zinc as metals of interest.

Indeed, the fine fraction of IBA contains around 0.3wt.% of copper and zinc but also 7wt.% of iron and 10wt.% of aluminum. Physical properties of copper and zinc compared to iron and aluminum make possible the use of physical concentration methods (as shaking table and magnetic separations). After these steps, the recovered concentrate represents no more than 9wt.% of the initial raw IBA mass.

The following hydrometallurgical treatment, that has been developed in this work, consist in four steps. After a washing step, a selective leaching is carried out using ammonia-ammonium chloride solution to avoid iron and aluminum leaching. The copper and zinc recovery steps from the leachate have been selected to minimize the modification of the leachate pH and composition in order to be able to reuse it. Zinc is recovered under the form of zinc-aluminum spinel by precipitation by aluminum nitrate addition [2]. Then, copper is recovered by electrodeposition directly from the leachate. This hydrometallurgical process, makes possible the recovery of up to 80wt.% of copper in its metallic form and 70wt.% of zinc in spinel form from a waste stream originally intended for landfilling.

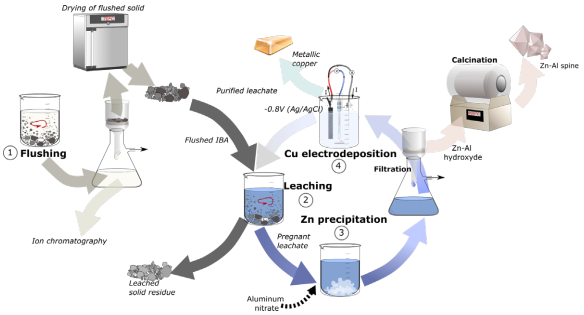

Figure 1: Schematic illustration of the developed hydrometallurgical process

[1] Characterization of Fine Fractions from the Processing of Municipal Solid Waste Incinerator Bottom Ashes for the Potential Recovery of Valuable Metals, Keber, S. *et al.* (2020), *Minerals*, 10(10), p. 838

[2] Spinel-type zinc aluminate (ZnAl2O4) nanoparticles prepared by the co-precipitation method: A novel, green and recyclable heterogeneous catalyst for the acetylation of amines, alcohols and phenols under solvent-free conditions, Farhadi, S. and Panahandehjoo, S. (2010), Applied Catalysis A: General, 382(2), pp. 293–302