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CLOSING THE MATERIALS CYCLE IN PYROMETALLURGICAL PRODUCTION OF LEAD FROM WASTE FRACTIONS: HYDROMETALLURGICAL PURIFICATION OF IRON CONTAINING WASTE IN VIEW OF RECYCLING

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Abstract

Pyrometallurgical recycling of lead from spent batteries entails secondary waste fractions generated in the blast furnace as iron stone and lead slags. For further purification of both fractions, hydrometallurgic processing is proposed. This paper focuses on purification of iron stone, in view of recovering metals (mainly lead) and of producing decontaminated iron stone fit for further recycling. The results demonstrate that iron stone is mainly composed of iron and lead; copper, zinc and antimony are also of importance. Leaching tests were carried out at pH 1 to 14. Iron leaching can be avoided when the pH is above 6 for residue from soft lead production (i.e, lead with low Sb content); for the fraction obtained from hard lead production (high Sb content), a pH above 13 is needed. Most other compounds (Na, K, Ca, Mn, Zn, Se, Mg) were leached efficiently; the challenges were Cr and Sb (although not critical since present in low concentrations), and Pb and Cu. A challenge, however, was in the variability of composition and extraction results, complicating the assessment of hydrometallurgical processing. In general, the yield of Pb was too low, and the loss of Fe was too large. Extraction with sulphuric acid, sequential extraction, addition of K_2CrO_4 and addition of $FeCl_2$ were explored to increase the leaching of Pb and Cu. None of these measures allowed a sufficient separation. However, the addition of $FeCl_2$ might improve the separation efficiency in the nitric acid extraction. Thus, it can be concluded that hydrometallurgic purification of iron stone is possible for a wide range of compounds but Cr, Sb, Pb and Cu may present problems, if present.

Key words: hydrometallurgic separation, iron recycling, leaching, lead production, solid waste

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