



RECYCLING OF ZINC BEARING RESIDUES: LEACHING BEHAVIOR OF SPENT BATTERIES AND EAF DUSTS IN SEVERAL AQUEOUS MEDIA

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Zinc is a base metal present in the composition of several products of general use, and therefore found in numerous residues and end-of-life products. Two main sources of zinc containing wastes are Zn-MnO₂ spent portable batteries and electric arc furnace (EAF) dusts from steelmaking plants. Both compositions are similar containing mainly zinc oxide (zincite) besides other metals like iron, manganese and lead, in different forms. The recovery of metals from these residues by appropriate recycling processes is mandatory due to environmental, economic and resource conservation issues.

Concerning similar composition of both residues, their simultaneous processing can be envisaged. This possibility is being investigated through the application of a hydrometallurgical process to treat zinc bearing wastes, described in this paper, where several leaching routes for solubilizing metals, mainly zinc, are presented and discussed.

The leaching of EAF dusts and shredded batteries was carried out using three leaching solutions containing sulfuric acid, hydrochloric acid or ammonium chloride. The acid leaching of zinc in oxide form (zincite) using both acids, was very efficient and quick, allowing the recovery of about 80% of Zn in dusts and practically all the Zn contained in batteries. Lead oxides present in dusts had different behavior respecting to the leaching media, being insoluble with H₂SO₄ and partially soluble with HCl (40-90% yield, depending on conditions). For battery waste, other important metal is manganese, which oxides were only partially soluble in acid media, attaining a maximum leaching yield of 90% Mn. Iron is a contaminant present in both residues, being partially leached and requiring further purification steps. The use of ammoniacal medium (NH₄Cl) was very selective for zinc, being iron practically insoluble. However, maximum zinc leaching yield attained was only near 60% for both residues. Under these conditions, manganese from batteries was very insoluble while lead from dusts was leached up to 70% due to relative solubility of lead chloride.

This research showed that hydrometallurgical treatment can provide versatile solutions for recycling metals from wastes. In this case, recovery of zinc can be achieved by any of the three leachants tested, being ammoniacal agents more selective and acids more effective but less selective. In this case more purification and separation steps are required before obtaining metals in pure forms.

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