Introduction

There are large amounts of non-ferrous slags dumped from nickel and copper smelters all over the world each year. Recovery of base metal values from this kind of slags is important not only for saving metal resources, but also for protecting the environment. The conventional method for recovery of base metals from the slags is re-smelting, which is very costly. However, no one to date has come up with an economically viable process for re-treatment of the waste dump slags. This selective leaching of valuable metals with extractions of 97.4%~99.5% for Ni, Co, Cu and Zn, and about 1% for iron was achieved. The produced residue containing less than 0.03% of heavy metals can be discarded safely.

Objectives

The objectives of this research are:
- To economically recover base metals, such as Ni, Co & Cu;
- To reduce the impact of slags on the environment.

Effect of Acidity

Base metal extractions increase significantly with an increase in acid addition from 15%wt to 25%wt.

Effect of Slag Particle Size

Smelting slag particle size has little effect on metal extractions under the current experimental conditions.

Time Dependence of Iron Dissolution and Free Acid

After leaching for 60 minutes, iron concentration stabilizes; however, it increases with an increase in acid addition.

Residue Settling Properties

An increase in temperature favours faster settling of residues.

Summary

- High pressure oxidative acid leaching was shown to be efficient and feasible for the treatment of smelter slags.
- Increased acidity favours high base metal extractions, and at the same time promotes the dissolution of iron. Slag particle size and pulp density have little effect on metal extractions under the experimental conditions.
- Selective leaching of metal values with extractions of 97.4%~99.5% for Ni, Co, Cu and Zn, and about 1% for iron can be achieved in 2 hours under the conditions of 25% acid addition, 73 psi oxygen overpressure and 250 °C.
- A typical leaching residue containing less than 0.03% of Ni, Cu, Co and Zn can be discarded safely.

Environmental concerns

The selective leaching of valuable metals and about 1% for iron was achieved. The produced residue containing less than 0.03% of heavy metals can be discarded safely.