

Flotation Separation of Anglesite and Silica from Zinc Leaching Residue

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Extended Abstract

Zinc leaching residue is a valuable secondary resource containing significant amounts of lead, silver, and other valuable minor elements [1]. Consequently, it is used as a raw material for lead smelting. However, in recent years, the grade of silica in zinc concentrate has been increasing, leading to a higher silica grade in zinc leaching residue. This results in challenges in the lead smelting process, including increased smelting costs, greater environmental impact, and rising transportation costs per unit of lead from the zinc smelter to the lead smelter. To address these issues, it is anticipated that separating anglesite and silica from the zinc leaching residue in the zinc smelting process will reduce the burden on the lead smelting process caused by silica. In this study, the possibility of separating anglesite and silica from zinc leaching residue was investigated using flotation.

In the flotation experiments, real zinc leaching residue obtained from a zinc smelter was used. The residue includes anglesite (PbSO_4), quartz (SiO_2), and contains 15.0% Pb and 31.7% SiO_2 . Prior to flotation, pretreatments were conducted in a high-speed agitator. Flotation experiments were conducted in an agitator-type flotation machine with a 400 mL flotation cell (air supply 1.0 L/min, stirring speed 1000 rpm). The reagents used were dodecylamine acetate (DAA) as a collector, methyl isobutyl carbinol (MIBC) as a frother, and mercaptobenzothiazole (MCB4) as a flocculant. As for the flotation conditions, the effect of collector dosage and the effect of flocculant addition were examined.

The results showed that at 400 g/t of collector, the Pb recovery and Si recovery to the concentrate were 61% and 30%, respectively. The use of DAA enabled the selective flotation separation of anglesite from zinc leaching residue. However, the separation of Pb and Si did not improve when the dosage of collector was increased from 400 g/t. The results also showed that at 400 g/t of collector and 25 L/t of flocculant, the Pb recovery and Si recovery to the concentrate were 87% and 36%, respectively. Compared to flotation without flocculant, the separation of Pb and Si was enhanced. The Pb and SiO_2 grades of the concentrate were 29% and 16%, respectively. This is attributed to the addition of the flocculant MCB4, which has a relatively high affinity for Pb^{2+} , selectively agglomerating the fine particles of anglesite that could not be recovered by flotation without agglomeration, thereby facilitating their recovery to the concentrate. The results of this study suggest that the flotation process with the combined use of DAA as a collector and MCB4 as a flocculant is an effective method for separating anglesite and silica from zinc leaching residue.

References

- [1] Du, Y.; Tong, X.; Xie, X.; Zhang, W.; Yang, H.; Song, Q, "Recovery of Zinc and Silver from Zinc Acid-Leaching Residues with Reduction of Their Environmental Impact Using a Novel Water Leaching-Flotation Process," *Minerals*, vol. 11, no. 6, 586, 2021.