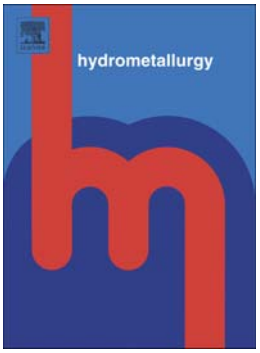

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Extraction of gallium and germanium from zinc refinery residues by pressure acid leaching

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Abstract: Pressure acid leaching of zinc refinery residues containing 0.266 wt.% Ga and 0.363 wt.% Ge was performed. The effects of the experimental parameters on the leaching of gallium and germanium and the filtration performance of the leach slurry were systematically investigated. The results show that the losses of Ge and Ga rapidly decreased because of the aggregation of amorphous silica under the pressure leaching conditions. Furthermore, the Ge leaching and filtration performance of the leach slurry were improved by adding calcium nitrate, which can be attributed to the oxidation of metallic Ge and its sulfides and the formation of calcium sulfate. The optimal leaching conditions are as follows: temperature of 150℃, sulfuric acid concentration of 156 $g \cdot L^{-1}$, liquid-to-solid ratio ($mL \cdot g^{-1}$) of 8, total pressure of 0.40 MPa, calcium nitrate addition of 20 $g \cdot L^{-1}$, stirring rate of 300 $r \cdot min^{-1}$, and leaching time of 3 h. Under the optimal conditions, more than 98% of the Ga and 94% of the Ge were leached. Moreover, the filtration rate of the studied leach slurry was 20 times faster than that of the leach slurry that was obtained under atmospheric pressure acid leaching conditions.

Keywords: Zinc refinery residue; Gallium; Germanium; Pressure acid leaching; Filtration performance