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Effect of pH on the selective separation of metals from acidic wastewater by controlling potential

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Highlights:

1. An art of metal selective separation from waste-water by potential control was proposed.
2. 3D E-pH diagram of Cu-Co-Zn-Mn-S-H₂O system was plotted by thermodynamic calculation.
3. Cu could be selectively separated from other metals by sulfide precipitation.
4. Co and Zn were separated by xanthate precipitation which was affected by pH value.

Abstract: In the face of difficulties in separating similar metals from acidic wastewater, a new process is proposed to selectively separate metals from acidic wastewater by controlling potential. In this paper, the effect of pH value on precipitation ratio and separation efficiency is investigated. Through thermodynamic calculations, a 3D E-pH diagram of the Me-S-H₂O system was plotted. The results reveal that rising pH value is helpful for metal precipitation, but high pH value may cause co-precipitation of metals impurity. The crystallinity and size of precipitates are obviously affected by pH value. Co can be effectively separated from Zn by xanthate precipitation under controlling potential, and the xanthate dosage is dependent on pH value. Mn-inclusions appear in Zn-precipitate due to high Mn²⁺ concentration. The optimal pH value for Cu²⁺, Co²⁺, and Zn²⁺ precipitation were 1, 2, and 2, respectively. Mn²⁺ could be recovered by carbonate precipitation from the solution after Zn removal. Cu²⁺, Co²⁺, Zn²⁺, and Mn²⁺ precipitation ratios reached to 99%.

Key words: selective separation; pH value; potential; xanthate precipitation

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