



## Recovery of cupric oxide from copper-containing wastewater sludge by acid leaching and ammonia purification process

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### ABSTRACT

The purpose of this study is to provide an efficient, simple, and economical method for the recovery of copper and removal of oil residue from copper-containing wastewater sludge using acid leaching and ammonia purification. In the first stage, sulfuric acid and hydrogen peroxide were used to leach a homogeneous suspension. The copper extraction percentage exceeded 90% in 30 min and oil residue was removed from the sludge. In the second stage, ammonia/ammonium carbonate media were used to purify the sulfuric acid leachate by forming an ammine complex. Through this process, ammonium hydroxide was recovered using an evaporating device and copper hydroxide was transformed into cupric oxide. The purity of copper in the oxide compound reached 98.26%. The economic evaluation of this process for a capacity of six tons of copper-containing wastewater sludge per day is discussed. For an initial capital investment of NT\$3.2 million with annual operating and maintenance costs of about NT\$3.13 million, the comparative savings in sludge treatment would be about NT\$1.44 million per year. Given an annual net profit from sales of cupric oxide powder of about NT\$3 million, total investment in the two-stage leaching process would be repaid in 30 months.

*Keywords:* Copper-containing wastewater sludge; Acid leaching; Ammonia leaching; Cupric oxide

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