

# Recovery of gold ions from ammonium thiosulfate using synergistic effects of aluminum and activated carbon

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## ABSTRACT

In hydrometallurgy, ammonium thiosulfate medium is an alternative to cyanide or halides, which is toxic and highly-corrosive as it is non-toxic as well as low-corrosive. Although the solution has those kinds of advantages, its application in real plant is limited because of difficulties in the recovery of gold ions from the leached solutions. Conventionally, cementation (i.e., reductive deposition of dissolved metal ions) of gold ions using base metals (e.g., zinc, copper, or aluminium) or adsorption of gold ions to activated carbon are employed, but these methods are inefficiency in ammonium thiosulfate medium. In a previous study of the authors, it was found that gold leaching efficiency of printed circuit boards was low since dissolved gold ions were re-deposited on coexisting copper attached to aluminium via cementation/precipitation, indicating that the cementation of gold ions using aluminium as reductant could be enhanced by coexisting conductive materials such as activated carbon. In this study, the recovery of gold ions from ammonium thiosulfate solution was investigated in the presence of aluminium with activated carbon. Predetermined amounts of aluminium and conducting particles were mixed in 10 mL of solution containing 1 M  $\text{Na}_2\text{S}_2\text{O}_3$ , 0.5 M  $\text{NH}_3$ , 0.25 M  $(\text{NH}_4)_2\text{SO}_4$ , 10 mM  $\text{CuSO}_4$  with 100 ppm of gold ions (pH 9.5-10) for 24h at 25 °C. The recovery results showed that the addition of 0.15 g of activated carbon was effective to enhance gold recovery with 0.15 g of aluminium as reductant showing the >99% of gold recovery while the gold recovery using single material (i.e., single activated carbon or single aluminium) was negligible.