Extracting gold and copper from electronic waste, commonly referred to as e-waste, involves several steps and methods. E-waste contains various valuable metals, including gold and copper, making it an attractive source for recycling and extraction. The extraction of gold and copper from e-waste is important for environmental sustainability, resource conservation, waste reduction, energy savings, and economic development.

The delamination of waste printed circuit boards (WPCBs) obtained from end-of-life e-waste, the oxidative leaching of the metallic fractions, and the separation and recovery of copper and gold by solvent extraction to define a technically feasible process that can recycle these valuable metals from e-waste. A two-stage leaching process is employed to better separate the high concentrations of copper and to facilitate clean gold dissolution and recovery.

Step 1: Pre-procesing: After collection of e-waste, it is segregated, delaminated, cleaned with water and acetone and treated with N,N-dimethylacetamind (DMA) to remove the organic components (epoxy resins) present in the e-waste. This pretreated e-waste is shredded into small pieces and powdered, further it is subjected to recovery of precious metals. The metals were dissolved in acid and non-metallic component such as plastic and ceramic is separated by filtration.

Step 2:

Stage-1 leaching – copper dissolution

The selective dissolution of copper over gold was targeted using nitric acid as the leach solution. The samples of the metallic fraction from the delamination process were treated with dilute nitric acid for complete leaching of copper without any dissolution of gold.

Stage-2 leaching – gold dissolution

most effective leaching of gold (95%) is observed using 3 M sulfuric acid with 3 M NaBr, for 1-h residence time, at 70 ◦C and 500 rpm stirring speed. It should be noted that this second-stage leach solution also contains tin and silver so further purification is required.

Step 3: Solvent extraction

Recovery of copper: The selective recovery of copper from the stage-1 leach solution was undertaken using a solvent extraction process with the phenolicoxime in kerosene with a 4 M sulfuric acid stripping agent to achieve a 99.9% of the total copper content, along with minor impurities of zinc (0.05%) and lead (0.02%).

Recovery of Gold: The selective recovery of gold from the stage-2 leach solution is carried out using solvent extraction. The transportation of gold from the leach liquor into a toluene solution consisting of tertiary amide as extractant and 1 M NaOH is used as the stripping reagent to achieve 99% of Au recovery.