



**Keywords:** *Leaching, Solvent Extraction, Precipitation, Electrowinning*

### Methods and Materials

- 1. Leaching:** *The leaching process involves the extraction of metals from their ores using a suitable solvent. In this study, the leaching of copper from malachite ore was carried out using a dilute sulfuric acid solution. The leaching was performed in a stirred tank reactor at 50°C for 24 hours. The leaching efficiency was determined by measuring the concentration of copper in the leachate.*
- 2. Solvent Extraction:** *Solvent extraction was used to separate the copper from the leachate. The leachate was contacted with an organic solvent, methyl isobutyl methyl ketone (MIBK), which selectively extracts copper. The extraction was carried out in a mixer-settler at 25°C. The extraction efficiency was determined by measuring the concentration of copper in the organic phase.*
- 3. Precipitation:** *The copper was precipitated from the organic phase using a dilute sodium hydroxide solution. The precipitation was carried out in a stirred tank reactor at 25°C. The precipitation efficiency was determined by measuring the concentration of copper in the precipitate.*
- 4. Electrowinning:** *The copper was electrowon from the precipitate using a constant current electrolysis process. The electrowinning was carried out in a stirred tank reactor at 25°C. The electrowinning efficiency was determined by measuring the amount of copper deposited on the cathode.*

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