



Industrial Consultancy & Sponsored Research (IC&SR)

Sequential Extraction of metals from Printed Circuit Boards by hydrometallurgical route

IITM Technology Available for Licensing

Problem Statement

- Rapid developments in electronic industry has resulted in accumulation of electronic material which have reached the end of life. This has resulted in accumulation of ewaste. which can lead to severe pollution of ground water sources.
- A large fraction of metals (Cu, Sn, Pb, etc.) contributes to **increase toxicity levels of ecosystem**. Therefore, there is a need to **recover the metals** from e-waste.
- It is estimated 5 MMTonnes of ewaste is generated annually. Current technologies for treating, managing & handling of e-waste, use **highly toxic chemical reagents** and cause acidification of soil. Hence, there is a need to address above issues.

Technology Category/ Market

Technology: Extraction of Metals from PCB

Industry: E-waste management, Chemical

Applications: Chemical, e-waste management

Market: The global Printed Circuit Boards (PCB) E-scrap recycling market is projected to reach **\$230.3B** by **2031**, at a **CAGR** of **12.9%** during the period (2024-2031)

Technology

- Present invention describes a **Sequential Extraction of metals from Printed Circuit Boards by hydrometallurgical route using a single acid**.
- The features of the present invention is disclosed hereinbelow:
- Recovery of **salts of tin, lead, & copper** from **scrap PCBs** in a **sequential manner** by **changing** only the **concentration of nitric acid**.
- Further said invention discussed a process for recovery of **NO_x** emissions during the treatment of PCBs with concentrated nitric acid. A pilot plant to process 100 tonnes per annum of waste is set up at BHEL Trichy.

The steps talks about that adding 2.0-2.5M nitric acid to PCBs to obtain a colloidal solution of stannic acid & recovering said acid;

Concentrating the dilute solution of lead nitrate and H₂NO₃ acid by evaporating/ distilling & cooling the concentrated solution to obtain lead nitrate crystals/ Powders;

Finally, Filtering said lead nitrate from the solution & further sequentially obtain the copper nitrate by extraction

Key Features / Value Proposition

- ❖ **Technical Perspective:** The present invention talks about obtaining **lead nitrate** (crystal or power forms) & obtained **tin** precipitate from stannic acid solution & the **copper nitrate** from the copper nitrate solution.
- ❖ Concentrating the dilute solution of lead nitrate & nitric acid by **evaporating or distilling & cooling** the concentrated solution to obtain lead nitrate.
- ❖ **Industrial Perspective:** Features are given as **safe, eco-friendly, sustainable, & cost-effective/economic process**.

Intellectual Property

IITM IDF Ref.1758; IN Patent No:534454
PCT Application No. PCT/IN2019/050610

TRL (Technology Readiness Level)

TRL-4, Proof of Concept ready & validated

Research Lab

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Image

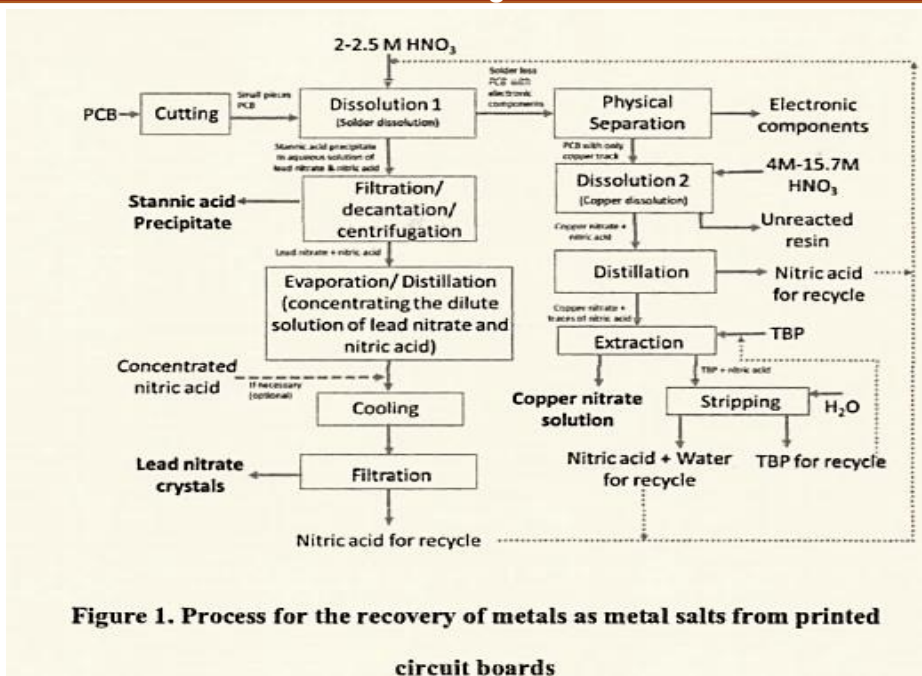


Figure 1. Process for the recovery of metals as metal salts from printed circuit boards

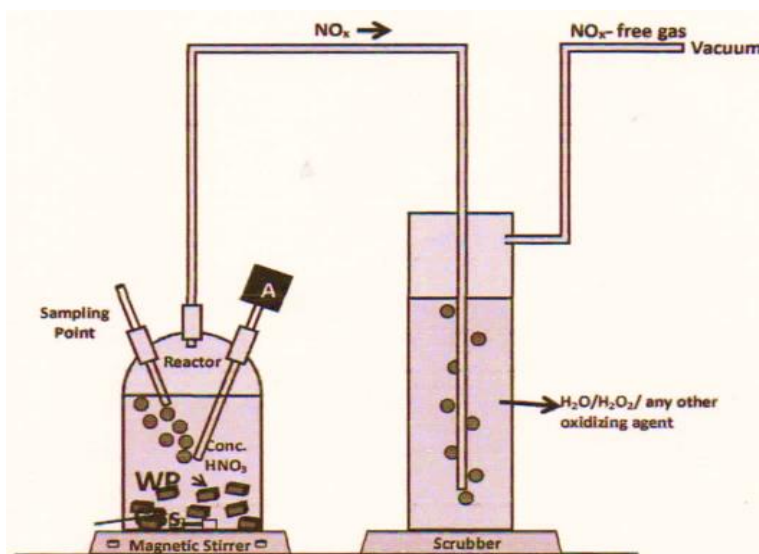


Figure 2. Process for the recovery of NO_x emissions during the treatment of PCBs with concentrated nitric acid

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