Novel preprocessing methods for enhancing the recovery of Critical Materials from E-Scrap

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Technology Summary

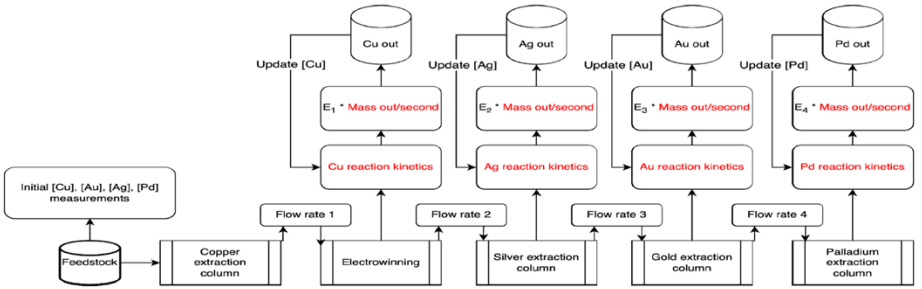
The Electrochemical Recycling Electronic Constituents of Value (ERECOV) method uses an electrochemical cell to efficiently recover the bulk of base metals from e-waste, leading to more complete recycling of materials while significantly minimizing chemical use and waste generation. The following end-to-end solution's concept is based on our 4 years' experience in commercializing the lab-to-plant ERECOV technology.

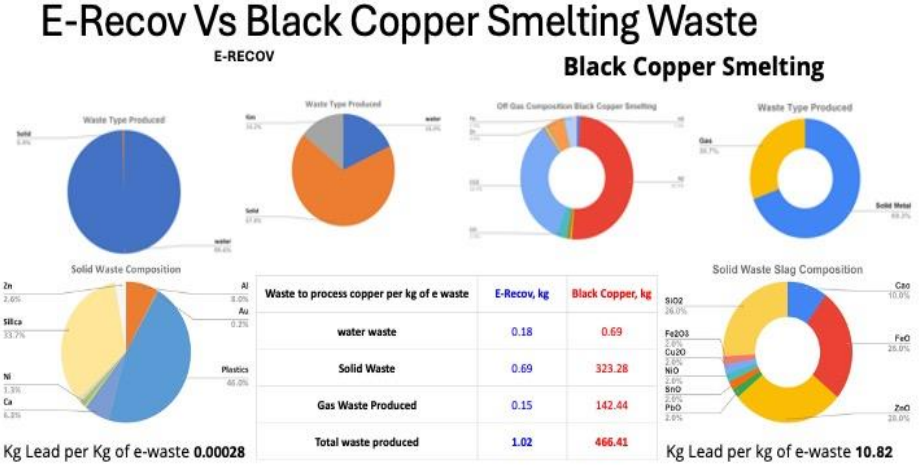
- Feedstock Preprocessing Module – developed capabilities and techniques to manage heterogeneous feedstock and control/monitor preprocessing operations. Controlling and monitoring preprocessing operations is the fundamental control block.
- Feedstock Characterization and Integration – adding capability to track material attributes and facilitate in-situ monitoring and integrate it with Digital Engineering/Digital Twin and IOT.
- Material Flowability Engine – real-time analysis of applying multiple mechanisms of force and address material flowability
- Materials Conditioning Engine– capability to control the impact of material variability and its overall impact on e-waste extraction and dynamic planning.
- Material Consistency Engine – the ability to refine material attributes for increased consistency control the unpredictable nature of the feedstock and streamline predictable outputs.
- Digital Engineering/Digital Twin Development – technology that connects all these processes.
- Real-time IOT sensing – another critical glue that connects real-time sensor performance to create better production planning.

These are the optimizations that we need to implement to have a successful ERECOV. Not only do these added steps improve the material characterization of E-Scrap, but they also mitigate the risks of diminished recapture of Critical Materials, cost of preprocessing, lackluster profitability, and lessening human error while increasing the demand for staff at each stage of the process.

Proposed project goals

- De-risking of the electronic recycling industry via reduction of labor costs and safety hazards associated with manual data collection.
- Implementing in-line sensors to gather data autonomously
- Autonomous data collection and transfer to a digital control system capable of making low-level decisions autonomously
- Create converging predictable equations that will allow for a higher level of digital process control
- Development of a digital twin to predict mass balances in real-time based on measurements from the in-line sensors.





E-Scrap recycling using 75% less chemical reagents with a 25% higher recovery of metals at 30% less cost and 80% less emissions!