Technology Readiness Level: 5
Component and/or Breadboard Validation in Relevant Environment

Eltron Research & Development

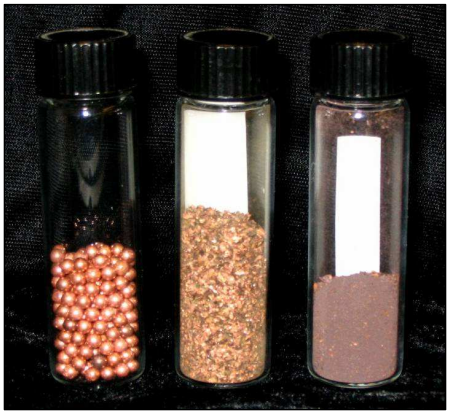
Tech Brief

Profitable Metal Recovery From Mixed Leach & Waste Streams

Benefits

- Continuous, automatic process
- Copper product is bright shot, bright flake or powder
- Produce copper present in concentrations ranging from 10s of ppm to several percent
- Selective production of copper (98-99.9% purity) from contaminated or mixed feed streams
- Regeneration of IX regeneration solutions; regenerates acid, recovers metals
- Removal of copper from precious metal leach.
- Proceeses halide-based feed streams without chlorine emissions.
- Hydrogen evolution minimized, contained and controlled
- Acid aerosols contained
- Capable of capturing other conventionally electrowinnable base metals, precious metals, platinic metals
- Electrode shorting by dendrites eliminated

Eltron Research & Development has created an electrowinning system that enables economic recovery of saleable metals from lower grade ores, leach solutions, extraction fluids, electroplating baths, IC process water or waste streams. **Eltron's electrowinner technology offers mining operations a means to profitably harvest base metals, present in concentrations ranging from tens of ppm to several percent, from precious metal, platinic metal and other base metal leach solutions.**

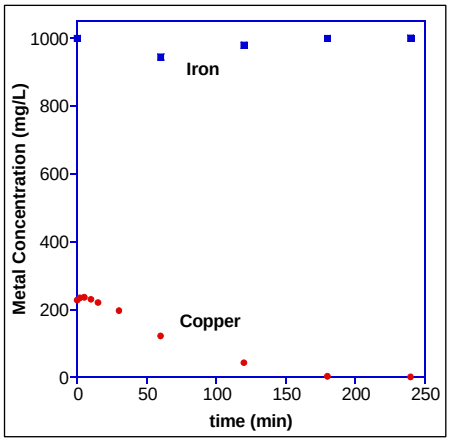


Copper produced as bright plating (left), bright flake (center) and dendrites (right) with Eltron's electrowinning technology.

Eltron's system addresses needs for reducing capital, operating, and waste treatment costs in a variety of industries including mining, refining, electronics, automotive, and environmental remediation. Eltron's technology has been specifically aimed at improving the economics for metal recovery from sources that otherwise have proven to be unprofitable. The patent pending technology can continuously and automatically harvest copper, nickel, cobalt, gold, silver, platinum and other metals. The fully automated process includes product separation, which is one of the features that contribute to the attractive economics of the system.

Stage of Development

Eltron's electrowinner technology is in the prototype stage of development and, given the demand and market price, is currently optimized for copper extraction. **Eltron's system has demonstrated copper production of nearly 130 lbs/day/m^2 superficial cathode area. It also has shown selective production of copper that is 98% to 99.8% pure**. Eltron has a patent application filed with the USPTO, Serial # 12/051,774 *Electrowinning Apparatus And Process*.



Copper removal from a mixture of copper and iron, pH 2.3 H_2SO_4 electrolyte, batch process.

The system can electrowin metals from leach directly fed into it or from a pre-concentrated leach solution. The reactor design cuts capital investment and can be scaled to match application requirements. Operator safety is improved, since the system is able to process halide-based feed streams without chlorine gas production, contain acid aerosols and minimize, contain and control H_2. And, the system can run unattended, helping to reduce labor requirements.

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Process fluid and product recovery is continuous. Unlike conventional systems, Eltron's electrowinner does not require periodic shutdown to extract the metal, virtually eliminating system downtime and further cutting labor. The system enables regeneration of acids, further reducing operating costs in IX or acid leach processing.

The system can selectively recover a sought-after metal from a mixed feed stream. In testing of water collected from the Berkeley Mine Pit, Eltron's technology has shown to selectively recover copper down to approximately single ppm concentrations, at a pH of 2.5 to 2.6, with sulfate as the primary anion. The copper product was greater than or equal to 99.8% pure without detectable amounts of trace metals impurities (see table below).

Concentration in mg/L	Surface Water as Received	Surface Water Processed	Deep Water as Received	Deep Water Processed
Aluminum	230	240	220	220
Arsenic	0.041	not detected	0.036	not detected
Cadmium	1.7	1.6	1.7	1.4
Cobalt	1.4	1.4	1.3	1.3
Copper	**63**	**5.7**	**140**	**4.4**
Iron	380	510	760	840
Manganese	250	270	220	230
Nickel	1.0	3.0	0.95	4.2
Zinc	600	630	570	590

Although the value of copper varies over time, the economics of Eltron's electrowinner can be determined in light of performance characteristics that have been identified during development. The calculations in the following table assume Cu at $1.20/lb scrap trade price.

Operating parameters Flow rate: 40 gpm Copper concentration in: 10,000 ppm Copper concentration out: 2,000 ppm Copper production rate: 4,400 lb/day	**Capital costs** 5 year linear depreciation: $231,000/year 10 year linear depreciation: $115,500/year
	Operating Costs **$1,007/day** Electrical: $340/day Consumables: $660/day Labor: $720/day
Copper Sales: $5,500/day	**Gross Margins** 5 year linear depreciation: $1,407,000/year 325% 10 year linear depreciation: $1,522,000/year 403%

Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

Eltron Research & Development Inc.
Eltron Research & Development Inc. commercializes novel technologies involving advanced materials, energy, water and environmental systems.

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