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Method of Precious-Metal Recovery from Waste Streams

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Invention Description

Growing global demand and short supply have necessitated new methods to recover precious metals, especially for those in the platinum-group metals (PGMs). Thus, recovering precious metals from waste streams is becoming increasingly important. Practical limitations to recovering PGM from waste streams using conventional methods include labor, capital, and operating expenses, as well as environmental release of toxic agents. New systems are needed to reduce PGM contaminants while retaining the PGMs in highly catalytic nano-particle (i.e., not aggregated) form.

Researchers at Arizona State University have developed a system that removes and recovers PGMs, such as palladium, from waste streams and recycles them for catalytic applications. This system successfully overcomes many deficiencies in current approaches and makes precious-metal recovery from major waste streams commonly found in the mining, metal-refining, and catalytic-converter industries commercially possible. This system recovers and retains nano-metals from acidic waste streams during long-term operation. Additionally, it enables the coupled catalytic and microbial reduction of a range of oxidized co-contaminants. In this “two-in-one” system, biofilms and biogenic nano-metals function as natural partners to sustainably enhance the overall efficiency of wastewater treatment and PGM recovery.

The advantage of the system is twofold: it removes contaminants from waste streams while also recovering and recycling precious metals that are already in limited supply.

Potential Applications

- Treatment of waste streams and wastewaters from the mining, metal-refining, and catalytic-converter industries:
  - Reduction and removal of hazardous metal contaminants
  - Recovery of PGMs
  - Recycling of PGMs for catalytic applications
  - Removal of co-contaminants

Benefits and Advantages

- Efficient removal and recovery of PGM contaminants from wastewater
- The reduced PGMs are retained in their highly catalytic nanoparticle form
- Co-contaminants (including nitrate or chlorinated contaminates) are also removed from the waste streams or wastewaters
- Enhanced overall efficiency of water treatment processes
- Doesn’t require the use of a filter to prevent leaching of the reduced PGM nano-particles
- Utilizes inorganic electron donors that are non-toxic, low-cost, and have a negative CO_2 release