



## ENVIRONMENTALLY-FRIENDLY PROCESS FOR RECOVERING GOLD FROM WASTE FROM ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE OR E-WASTE)

### KEYWORDS

- Gold leaching
- Recycling and recovery
- Deep eutectic solvents

### Collaboration type

License agreement  
R&D Collaboration

### IP status

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### THE TECHNOLOGY IN A NUTSHELL

A gold leaching solution using environmentally-friendly chemistry, easy to implement and allowing an easy recovery of dissolved gold downstream of the process.

### STATE OF THE ART

Gold extraction from waste electrical and electronic equipment (WEEE or e-waste) or from ores requires a leaching step in which metallic gold is solubilized in an oxidized form. Traditional hydrometallurgical processes use large amounts of water and toxic, hazardous or aggressive substances (cyanides, concentrated inorganic acids, aqua regia, etc.), posing risks to human health and the environment.

### THE INVENTION

This invention relates to gold leaching using a solution containing dissolved Au(III) in a deep eutectic solvent (DES) based on choline chloride (ChCl). DES are an emerging class of solvents compatible with green chemistry objectives, potentially made from non-toxic, biodegradable substances, possibly sourced from biomass. Although the leaching agent is expensive due to its gold content, one equivalent of injected Au(III) allows for the recovery of three equivalents of Au(I) in a reaction with excellent atomic efficiency and conversion. The invention can be easily adapted to other solvents.

### CONTACT

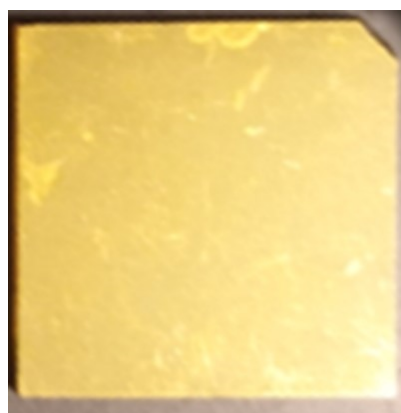


Figure 1 - Sample - gold film on glass. Photo before immersion in the leaching solution.

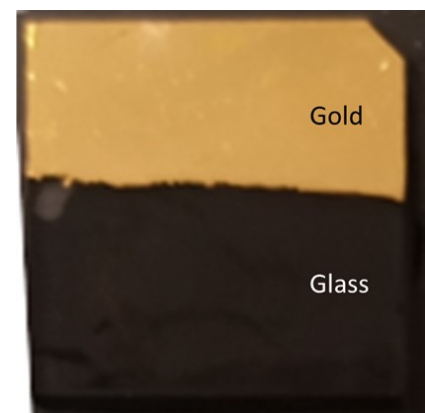


Figure 2 - Sample after immersion of the lower part in the leaching solution.

## TECHNOLOGY READINESS LEVEL



TRL-4 - Integrated prototype validated at the laboratory scale

### KEY ADVANTAGES OF THE TECHNOLOGY

- Environmentally-friendly & green process
- No use of harmful solvents (cyanide, mercury...)
- Rational use of water
- Excellent atomic efficiency & conversion and E factor

### POTENTIAL APPLICATIONS

Due to the high market value of gold and public policies promoting metal recycling and recovery, the invention has significant economic potential.

The proposed chemistry should be applicable for both WEEE and ores.



### THE TEAM

The inventors are members of the *Laboratoire de Chimie des Surfaces, Interfaces et Nanomatériaux (ChemSIN)* of the *Université libre de Bruxelles (ULB)* and of the *Laboratoire de Chimie Analytique, de Physique Spatiale et Energétique (L@CAPSE)* of the *Université Norbert Zongo (UNZ)* in Burkina Faso :

- **ChemSIN** has strong expertise in electrochemistry. Professor **Claudine Buess-Herman**, internationally recognized for her scientific contributions in interfacial electrochemistry, has led the laboratory for many years and developed innovative research themes on electrochemistry in non-conventional media (deep eutectic solvents, ionic liquids). Professor **Thomas Doneux** leads the interfacial electrochemistry unit at ChemSIN, developing research in bioelectrochemistry and electrodeposition.
- **L@CAPSE** conducts research in analytical chemistry and environmental chemistry to meet societal needs in Burkina Faso. Professor **Moussa Bougouma**, specializing in the synthesis and characterization of semiconductor materials, directs the Center for Metal Recovery and Valorization (CERVAM). Dr. **Fousséni Soma** completed a Ph.D. on the recovery of precious metals (Ag, Pd, Au) using environmentally-friendly chemistries.