July 4th 2023

Post-doctoral contract offer

Subject: Selective recovery of precious metals contained in DEE by electrochemical process in deep eutectic solvents

PEPR Recyclage –Strategic Metals Axis

General information

Workplace: Metz
Type of contract: Scientist position contract
Contract period: 18 months
Expected date of employment: From June 2024
Proportion of work: Full time
Remuneration: € 2555 to € 2890 euros gross per month depending on experience
Desired level of education: PhD
Experience required: Post doc or min. PhD doctorate in electrochemistry, with knowledge in metal deposition and hydrometallurgical processes

Keywords: printed circuit boards recycling, precious metals, deep eutectic solvents, electrochemical processes.

Missions / Activities

Scope

In the frame of the Strategic axis of the PEPR "Recovery, Renewal and Resilience in a Post-Pandemic World (RRR)", IJL and LRGP academic labs recruit a post-doctoral fellow, PhD doctorate in Electrochemistry of Materials having ground knowledge in chemical engineering. The purpose of the proposed work is the development of an electrochemical process for the efficient recovery of precious metals e.g. silver, gold, palladium, contained in printed circuit boards (PCBs). Such waste is far richer in precious metals than most primary resources, thus representing a huge economical potential while allowing preservation of natural resources.

The process to be considered relies upon coupling Electroleaching to Electrodeposition in a single electrochemical cell, with use of deep eutectic solvents of a low environmental impact (Natural Deep Eutectic Solvents, NADES). Within the current ANR-funded EE4Precious project (2021-2024), IJL and LRGP have demonstrated the feasibility of the process for single metal systems for the metals of interest.

The post-doc will go beyond the preliminary results obtained in view to applying the process to a refined metal phase, prepared treatment of PCBs by Terra Nova Développement (TND) company

Objectives and work programme

- Optimisation of electrochemical deposition of precious metals in a small lab cell provided with a sacrificial anode: the anode will be first a single metal phase, then a multimetal phase. The objectives targeted are
  - (i) To obtain high purity metal phase with a maximal faradaic yield in view to ensure solvent recyclability;
  - (ii) To produce deposits with sufficient mechanical properties and compactness for easy and efficient recovery of the metals.
- Design and test of a mini pilot cell whose design has to be compatible with industrial processes, for the treatment of the refined metal phase prepared by TND.

An active contribution in experimental work and technical development in the two parts is expected.

Work context

The research project will be mainly conducted in IJL (Metz), with occasional short work periods in LRGP in Nancy (approx.60 km from Metz). Assistance in some aspects related to modelling, data interpretation and reactor design will be provided in LRGP. Although to be of an engineering relevancy, the work project is mainly focused on electrochemistry and related technology.
This work will be carried out in relation with CEA-LITEN which will be committed in investigation of the stability and recyclability of the electrolytic medium.

Skills

PhD level in Electrochemistry or Electrochemical Engineering
High level competence in electrochemistry and characterization techniques of solid phases (XRD, SEM, EDS) are required.
Knowledge in chemical engineering and experience with deep eutectic solvents will be appreciated
High redactional and communication skills in French and English are expected.

Constraints and risks

The position offered is to be areas with high level protection of scientific and technical potential (ZRR). Therefore, as for any position offered IJL and LRGP, the recruitment can be effective only after authorization of the MESR. The necessary procedure will be launched by the recruiting labs with the selected scientist.

About recruiting labs

The Jean Lamour Institute (IJL) is a mixed CNRS-University de Lorraine laboratory (UMR 7198), belonging tor the Institute of Chemistry of CNRS. This lab for fundamental and applied research in science and material engineering, is installed in four locations in Lorraine: Nancy, Brabois, Metz and Epinal. It comprises 23 research teams in four departments, with 183 staff scientists, 91 Engineers/technicians/administrative staff members, 150 PhD students and 25 Post-doc. The “Material chemistry and electrochemistry” team in Metz, is specialized in the treatment and beneficiation of waste by green processes (electrochemistry, bio-sourced reagents, ionic liquids)

The Laboratoire Réactions et Génie des Procédés (LRGP) is one of the two major academic research labs in chemical engineering. Mainly hosted by ENSIC Institute but also by ENSAIA Institute, LRGP comprises approx. 280 persons being staff members (scientists, engineers, technicians, administrative) or under contract such PhD students or Post-docs. More precisely, F. Lapicque’s group is active on electrochemical processes for energy conversion and resource beneficiation: in the latter domain, often in collaboration with IJL Metz.

Application

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The application folder is to consist of:

- CV
- Cover letter expressing the candidate’s motivation
- Copies of MSc and Doctorate diploma
- Copies of Post-doc or lecturers contracts after the PhD
- Names and coordinates of two referents