Recruitment for a position of Assistant Professor (*Maître Assistant*) in Chemical Engineering

SPIN centre – Sciences des Processus Industriels et Naturels
Laboratoire Georges Friedel (UMR MSE/CNRS 5307)

1) Host environment and themes

The SPIN Center (« Sciences of Natural and Industrial Processes ») is a teaching and research center recognized for its expertise in Chemical Engineering applied to dispersed media (grains, particles, powders, porous media, soils …). It uses its scientific knowledge and top-notch equipment to bring innovation to industrial companies facing the challenges of energy optimization and high performance materials design.

The PEG (Processes for the Environment and Geo-Resources) research department develops in process engineering and geoprocesses, around a central theme of mineral chemistry (hydrometallurgy, speciation, precipitation, crystallization), implementing multiphase and multiphysics models of changes in spatial scales, from the nanometer to the kilometer. The department brings together a multidisciplinary community of around ten lecturer-researchers with backgrounds in process engineering and crystallization on the one hand, and geosciences on the other. The department is attached to two CNRS units, including the Georges Friedel laboratory (UMR CNRS 5307) for the Process Engineering theme in its industrial dimension.

In this environment, the position to be filled is part of a wider dynamic involving other departments of the SPIN center for the development of inorganic chemistry for Process Engineering. Although the SPIN center, and more specifically the PEG department, currently brings together a number of skills relating to geosciences, crystallization, thermodynamics, hydrometallurgy and multiphase flows, and wishes to strengthen the experimental skills in inorganic chemistry to support the department's existing themes:

- treatment and recovery of solid mineral materials,
- recycling and recyclability (water, soil, minerals, gases),
- transfer of contaminants,
- energy transport and storage.

2) Missions

Teaching

The teaching mission consists of providing lectures, tutorials and practical work, as well as supervising projects and internships, in all Mines Saint-Etienne courses, including the Ingénieur Civil des Mines (ICM) program. The teaching will also concern research Masters, doctoral training, continuous training and under salaried contract, specialized M.Sc. courses.

The candidate should be able to cover a fairly broad spectrum of existing or future teaching in the field of **process and/or environmental engineering** as example : Thermodynamics, Transfer phenomena, Fluid mechanics, Process simulation, Unit operation, Mineral resources, *etc*...

The candidate will be actively involved in the teaching teams in charge of the above-mentioned training courses. As such, the design of new activities and the development of innovative teaching methods, in particular through the use of digital technology, are an integral part of the teaching mission.

The candidate must be able to deliver his/her lessons and possibly MOOCs in English.

Research

As part of the PEG department's activities mentioned above, the future recruit will be required to develop the center's experimental skills in the following areas:

- **Treatment and recovery of solid mineral materials**
    - **Critical metals** (Rare-earth element, lithium, nickel, cobalt, *etc.*) ;
    - Phosphates, *etc.*
- **Recycling of anthropogenic waste** (urban mines, WEEE[1] dont batteries, déchets miniers, matériaux de construction ...).
- New uses for recycled materials in industry and agriculture.

Applicants must demonstrate that they have **in-depth scientific skills** in **one or more** of the following areas and describe how they have used these skills to develop their research project:

- **Chemical engineering**, particularly as applied to dissolution - precipitation - reaction
- **Mineral chemistry**,
- **Experimental thermodynamics**,

Experience of the following **unit operations** will be appreciated:

- Crystallization,
- Selective précipitation,
- Speciation
- Leaching,
- Physical separation methods (flotation, *etc.*)
- Analytical methods :
    - electrochemical,
    - spectroscopic (Raman, IR),
    - calorimetry,
    - ion chromatography,
    - ICP,
    - granulometric, *etc*.
- Use of models/softwares such as PHREEQC

[1] Waste from Electrical and Electronic Equipment
[2] Diploma for thesis supervision in France

He/she will also participate in the development of instrumented experimental devices, from laboratory scale to pilot scale, Technology Readiness Level 4 to 7, drawing on the resources of the SPIN centre.

The missions entrusted to him/her are to:

- **Conduct its research** in line with the objectives of the PEG department, the SPIN centre and Mines Saint-Étienne in general.
- co-supervising theses and research projects, and promoting results (publications, patents, *etc.*)
- participate in **research networks**: learned societies (SFGP), research groups (GDR Prométhée, *etc.*), competitiveness clusters (AXELERA),
- participate in setting up collaborative projects with national and/or international academic and/or industrial partners,
- participate in the search for **funding of research projects** with industry and public (ANR, ADEME, Horizon Europe, etc.) and private organizations,
- prepare the defence of the Habilitation à Diriger des Recherches (HDR)[2] within 5 to 7 years of recruitment.