PhD Position:
Electrical Stimulation Processes for Enhanced Uranium In-Situ Recovery

Project Background and Objectives

As part of the ANR Industrial Chair SATURNE in partnership with Orano, we are seeking a highly motivated PhD candidate to investigate the effects of electric fields on uranium recovery through Enhanced In-Situ Recovery (ISR) processes.

The primary objective of this research is to improve uranium recovery efficiency by promoting uranium mobilization within mesoporous regions that are often poorly accessed by conventional leaching solutions. Particular attention will be given to geological formations representative of high-grade uranium deposits in Canada.

The successful candidate will contribute to the understanding of the physical and chemical mechanisms governing electrically assisted recovery processes through the implementation of innovative experimental approaches and advanced characterization techniques. The research will focus on fluid transport under applied electric fields, electrokinetic phenomena in porous media, permeability enhancement mechanisms, and their impact on uranium mobilization under representative reservoir conditions.

Research Responsibilities

The PhD candidate will be involved in a broad range of experimental and analytical activities, including:

- Designing and conducting laboratory experiments aimed at optimizing electrical stimulation strategies and identifying the mechanisms governing enhanced uranium In-Situ Recovery;
- Developing and implementing advanced imaging techniques, particularly X-ray computed tomography (X-ray CT), to monitor fluid distribution, pore-scale structural changes, and permeability enhancement associated with ISR processes;
- Performing ICP-MS analyses to quantify uranium concentrations and evaluate the performance of electrically assisted recovery methods, including the evolution of deleterious elements and associated geochemical indicators;
- Interpreting experimental results and contributing to the development of numerical models capable of predicting reservoir response and recovery efficiency under electrical stimulation;

- Collaborating closely with Orano's Research and Development teams to facilitate the transfer of scientific knowledge toward industrial applications.
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Candidate Profile

Applicants should possess the following qualifications:

- Master's degree (or equivalent) in Physics, Electrical Engineering, Geosciences, Chemistry, Petroleum Engineering, or a related discipline;
- Strong background in porous media physics, reactive transport, hydrogeology, fluid mechanics, or related fields;
- Strong knowledge of Electrical Engineering, with particular emphasis on high-voltage systems and electric field applications;
- Experience with advanced X-ray imaging techniques, particularly X-ray computed tomography, is highly desirable;
- Ability to work independently while contributing effectively within a multidisciplinary research environment;
- Excellent communication, scientific writing, and teamwork skills.

Research Environment

The PhD project will be carried out at the University of Pau and the Adour Region (UPPA) within the framework of the ANR Industrial Chair SATURNE. The successful candidate will join an interdisciplinary research program at the intersection of fluid mechanics, electrical engineering, reactive transport in porous media, and reservoir engineering.

The project is conducted through a close academic–industrial partnership involving Orano, the Complex Fluids Laboratory (UMR 5150), and the SIAME Laboratory, particularly the High Power and High Voltage Technologies (PHT) research group.

The candidate will benefit from access to state-of-the-art experimental platforms, advanced imaging facilities, and regular interactions with industrial experts involved in the development of next-generation In-Situ Recovery technologies.

Application Procedure

Interested candidates are invited to submit:

- A detailed Curriculum Vitae (CV);
- A cover letter describing their academic background, research interests, and motivation for the project;
- Contact information for three academic or professional references.

Applications should be sent to: antoine.deferron@univ-pau.fr laurent.pecastaing@univ-pau.fr patrice.creux@univ-pau.fr