

Post doctoral position, 1 year, from february 2021

Wastewater purification by solidification: Simulation by phase field method ANR WATERSAFE

Context:

Clean water scarcity and the deterioration of the environment by releasing wastewater harmful to both flora and fauna are a worldwide concerning. The development of wastewater purification technologies is nowadays a technical worldwide challenge. Ice Layer Crystallisation on a cooling surface (ILC) is a melt crystallization process here considered for treating low concentrated and toxic soluble pollutants in aqueous liquid effluent. In this process, two products of separation are produced: i) a crystalline layer (ice) that can be poured in the environment according to its purity; ii) a concentrated liquid effluent which valorization depends on its composition. The process shows large limitations, which explains nowadays its low industrial development. Its deadlock status could however possibly be circumvented through: *i*) performing a process intensification study in order to improve its global efficiency; *ii*) improving process issue that include batch to continuous approach (process efficiency and management). To fulfil these points, the project intends to develop an innovative dynamic model based on the Phase Field Method [1] (PFM) to simulate the non-isothermal solidification of ice issue from a synthetic wastewater. The simulation tool purpose is to link the occurring morphologic crystallisation phenomena, i.e. ice growth rate and pollutant incorporation in ice, to operating parameters of the process to help the operator to choose the optimal operating conditions for a given yield and water purity.

Post doctoral mission:

The post-doctoral fellow will be in charge of the development of a dynamic and quantitative 2D simulation of ice crystallization from a binary mixture in stagnant conditions. The model equations will be based on the PFM approach. The adjustment of key parameters of the model will be carried out from experiments data and bibliographic researches. The experimental data will be achieved by performing several crystallization experiments in order to check i) the thermodynamic data of the chosen system and ii) achieve data on ice growth to feed the simulation and to define the new lab scale-pilot operating conditions and design.

The post-doctoral fellow will join the LAGEPP (Laboratory of Automatic Control, Chemical and Pharmaceutical Engineering) of the University of Claude Bernard Lyon1. The project will be carried out on collaboration with iLM (Institut Lumière Matière) laboratory.

Skills: The applicant will have doctoral degree in Chemical engineering or Physics. The position is suited for candidates with background in dynamic modelling, thermodynamics and crystallisation. Skills in Matlab or Python programming will also be appreciated. The candidate must be able to work in a multidisciplinary environment, to write the model and the program to simulate the non-isothermal solidification of ice.

To apply to the job offer:

Send curriculum vitae, transcripts with full list of courses and grades, the name and contact information of 2 references, relevant publications, job application letter and Phd thesis evaluation reports to Aurélie GALFRE (aurelie.galfre@univ-lyon1.fr). All documents must be in pdf, best as a zip file, and adequately named.