

November, 2024

Master internship

Morphological transitions during Al alloys solidification: phase-field modelling.

General information

Workplace: Nancy, France

Type of contract: master internship

Contract period: 4 to 6 months

Starting date: february 2025

Proportion of work: Full time

Remuneration: according to french law

Desired level of education: Master's degree in physics, chemistry or material sciences.

Experience required: -

Missions / Activities

Solidification of Al binary alloys, particularly Al-Cu alloys, has been widely studied by the phase-field method. On the one hand, those binary alloys are representative of many other industrial multi-components (sometimes up to 10 elements) alloys produced during castings (slow solidification). On the other hand, the thermophysical properties of the solid-liquid (S-L) interface of those alloys are well documented in the literature. Nowadays, the emergence of additive manufacturing processes encourages the innovations of chemically lean alloys (ternary at most) like Al-Zn alloys without loss of targeted mechanical properties. This could be achieved by the deep understanding of the microstructure dynamics during all the fabrication process, starting from solidification.

In this internship, we aim at the study of microstructure dynamics of Al alloys during solidification taking into account the short range order (SRO) in the liquid. We will focus on the morphological transitions in Al-Zn alloys. The thermophysical properties of the S-L interface will be gathered from molecular dynamics calculations in collaboration with SIMAP institute.

Work context

The intern student will be supervised by Dr A. K. Boukellal, Dr M. Plapp and Prof. J. Zollinger.

The intern student will be based at IJL, and regular zoom meetings will be organized with Dr. M. Plapp (from Laboratoire de Physique de la Matière Condensée, Palaiseau).

Skills

Knowledge of thermodynamics of phase-transitions (Solidification), metallurgy

High interest in numerical simulations.

Knowledge of phase-field modelling is appreciated.

Knowledge of English (oral and written) is important and knowledge of French would be an advantage.

As an enthusiastic student you like team work, and have a flexible approach to collaborating with experimentalists.

Constraints and risks

The position you are applying for is located in a sector relating to the protection of scientific and technical potential. It therefore requires, in accordance with the regulations, that your arrival be authorized by the competent authority of the Ministry of Higher Education, Research and Innovation.

About Institut Jean Lamour

The Institute Jean Lamour (IJL) is a joint research unit of CNRS and Université de Lorraine. Focused on materials and processes science and engineering, it covers: materials, metallurgy, plasmas, surfaces, nanomaterials and electronics. It regroups 183 researchers/lecturers, 91 engineers/technicians/administrative staff, 150 doctoral students and 25 post-doctoral fellows. Partnerships exist with 150 companies and our research groups collaborate with more than 30 countries throughout the world. Its exceptional instrumental platforms are spread over 4 sites; the main one is located on Artem campus in Nancy.

Application

Applicants are invited to send a CV and cover letter together with diploma copies to:

A. K. Boukellal (CNRS Researcher) : ahmed.boukellal@univ-lorraine.fr

M. Plapp (CNRS Researcher) mathis.plapp@polytechnique.fr

J. Zollinger (Full professor): julien.zollinger@univ-lorraine.fr