



Call for PhD Candidate Applications

Advanced Leidenfrost Effect

Funding: European Commission HORIZON-MSCA-2023-DN-01-01 GA: 101169365

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General Information:

When a liquid droplet is placed on a solid surface with a temperature significantly higher than the boiling point of the liquid, the droplet “levitates” above the surface on a thin layer of its vapor, a phenomenon known as the **Leidenfrost effect**. While this effect is highly undesirable in certain cooling applications due to the **reduced energy transfer** between the solid and evaporating liquid caused by the poor heat conductivity of the vapor, it can be of significant interest in various processes where avoiding contact with the surface is advantageous.

The [LeidenForce project](#) aims to comprehensively study the Leidenfrost effect and propose novel applications, either to mitigate its adverse effects or leverage its advantages. More concretely, the objectives of the LeidenForce consortium are to:

- (i) shift the fundamental understanding of the transition to the Leidenfrost state,
- (ii) optimize the heat transfer between the droplet and the substrate,
- (iii) utilize the isolated droplet to manipulate small amounts of liquid in unconventional scenarios (e.g., on a liquid surface, within a channel), and
- (iv) harness the vapor film to capture or confine particles using an external electrical field.

The practical implications will be leveraged by non-academic institutions involved in aviation (such as AIRBUS), metallurgy (CRM), and space exploration (Centre Spatial de Liège).

Hiring Institution

Hiring LeidenForce Member: [Université libre de Bruxelles](#)

Address: ULB, Av. F.D. Roosevelt, 50, CP 165/67, B-1050 Brussels – Belgium

Type of fellowship: temporary : 36 months (MSCA) + 12 month (FWB)

Job status: full-time

Hours per week: 38 hours

Offer starting date: **01/03/2025**

EU Research Framework: HORIZON-MSCA-2023-DN-01-01 GA: 101169365

Open Position

Topic: Leidenfrost effect in multiphase microfluidics

Description: The PhD candidate will (A) explore the feasibility of using the Leidenfrost effect in confined milli/micro-channel systems and investigate under what conditions does this levitating regime establish (in both situations anti-Bretherton and micro-antibubble); and (B) understand the shape of these drops, as well as their dynamics in terms of formation, motion and evaporation. To do so, it is planned to study in detail features related to objectives A and B for several couples of fluids, size of the drops, degree of confinement and superheating. Mathematical model will then be developed for the shapes and the dynamics of the Leidenfrost drops and their surrounding vapor films. In the anti-Bretherton situation, the PhD candidate will extend the Bretherton model to include evaporation, similarly to self-propelled Leidenfrost drops. In the micro-antibubble situation, the dynamics of a vapor lubricating film fed by the evaporation of the drop will then be modelled with an intermediate approach between the modelling of an antibubble and that of a Leidenfrost drop. The modelling will be improved according to experimental agreement by accounting for heat and mass transfers under flow conditions in the surrounding phase. The work will essentially be experimental at the host institution at ULB, with a secondment of 12 months at the Université de Pau (France), supervised by Benjamin Sobac, on data analysis and modelling.

Supervision: [Benoit Scheid](#)

Hosting lab: [Transfer, Interfaces and Processes](#) - Microfluidics

Location:

Ecole Polytechnique de Bruxelles

C.P. 165/67 – Av. F.D. Roosevelt 50, B-1050 Bruxelles – Belgium

Benefits

The MSCA programme offers a competitive salary and attractive working conditions, in accordance with the MSCA regulations for Doctoral Candidates (DC).

You will be enrolled in the PhD programme at the Université Libre de Bruxelles (ULB), and have the opportunity to learn from a consortium of 8 institutions (10 Beneficiaries + 3 Partner organizations). In addition to the individual scientific projects, all DCs will benefit from further continuing education, which includes possible secondment to Pau University, a variety of training courses for specific and transferable skills and active participation and international conferences.

Successful candidates will be offered a 48 months full-time fellowship, with a monthly salary of **3400.00 € (average gross salary, before statutory deductions; corresponding to a net amount around 2.350,00 € for EU-fellows and about 2640,00 € for non-EU fellows)**, plus an additional **mobility allowance (600€ per month, unconditional)**, and an additional **family allowance (600€ per month, if applicable)**.

Eligibility criteria

- a) To apply for these MSCA Training positions, applicants must fulfil the following criteria:
- Mobility: to be eligible for a position, you should not have resided in the country of the host institution for more than 12 months over the three years before the starting date of the position, excluding holidays and (refugee status) asylum application.

Candidates must prove that they fulfil the aforementioned criteria through relevant documentation (certificates, official statements, residency card, ...).

b) Specific requirements for the proposed project:

- Educational Level: Master in engineering, physics, chemistry, or equivalent.
- Required languages: English
- Skills/Qualifications: The candidate should ideally have experimental/modeling skills
- Eligibility to enrol in the PhD programme of the Université Libre de Bruxelles:

acquired 60 ECTS of bachelor and master training.

Selection Criteria

The selection committee uses a number of indicators to evaluate the applicant's preparedness, motivation and potential.

1st phase, remote pre-selection:

The Scientific, Technological & Academic excellence will be considered at first, based on:

- Quality of the CV, in general
- Any demonstrated research experience, in particular internships on similar topics or using similar techniques.
- Undergraduate performance: overall, with a special focus on relevant field-specific courses
- Any demonstrated previous recognitions (grants, awards, ...)
- Reference letters provided by professors and senior scientists: Two reference letters are expected.
- Statement of purpose: past research experience, motivation for applying to this particular PhD project, academic fit, contribution of the project to the candidate's future careers plans, ...
- Additional relevant skills (field-specific): demonstrated, e.g. through previous projects, and or through previous participation in scientific contests, trainings, ...

2nd phase, interview(s):

Should the candidate be preselected at phase 1, a second phase will consist in at least one interview (in presence or at distance) through which the motivation, the proactive behaviour, the capacity to work collaboratively, the organizational skills, the communication skills and the capacity to engage in a scientific discussion and manage problems, will be assessed, among other aspects.

The final decision will be the result of a consensus of an evaluation committee that will take into account the results of both recruitment phases 1 and 2. The candidate will be informed of the section results by email.

The evaluation committee will be trained to avoid any gender or minority biases.

Application Process:

All the documents that prove the eligibility of the candidate should be provided. As for the selection process candidates are expected to provide at least the following documents:

- A brief introduction letter (no more than one A4 page) that summarizes the documents and the nature of the information provided for the selection
- A full CV
- The two requested reference letters
- The letter of purpose (no more than one A4 page)

All documents must be sent by email to the Principal Investigator of the proposed project (Benoit Scheid – Benoit.Scheid@ulb.be) **before March 24th 2025**. The title of the application email should be “LeidenForce PhD position ULB” in order to ensure correct processing. Every incomplete application will be rejected.