

Master 2: *International Centre for Fundamental Physics*

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Laboratoire de Physique des Solides (LPS)

CNRS identification code: UMR-8502

Internship director's surname: Smallenburg

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Phone number:

Web page: <https://www.lps.u-psud.fr>

Internship location: LPS, Orsay

Thesis possibility after internship: YES

Funding already obtained for a PhD: NO

If YES, which type of funding:

Effect of interaction softness on crystal-fluid interfaces

Understanding the nucleation of crystals is of profound importance both for fundamental and technological reasons. Surprisingly, even in the simplest crystallizing system we can think of – hard spheres – simulation predictions and experimental measurements of nucleation rates currently differ by many orders of magnitude -- sometimes called the “second—biggest discrepancy in physics”. A possible explanation for this discrepancy is a mismatch between experimental colloidal systems and true hard spheres: subtle interactions may influence the structure and dynamics of the fluid and crystal nucleus.

In this project, you will use recently developed simulation methods to explore how small deviations from hard-sphere interactions influence the interface between the fluid and the crystal. You will learn how to simulate simple colloidal model systems, and explore the statistical physics of fluid-crystal interfaces. Using simulations, you will reveal how subtle changes in these interactions may impact nucleation behavior. The ideal candidate has a strong background in physics and statistical mechanics, as well as an affinity for coding and/or computer simulations.

Although this project is primarily computational in nature, it is part of an ANR funded project in collaboration with an experimental group at ESPCI.

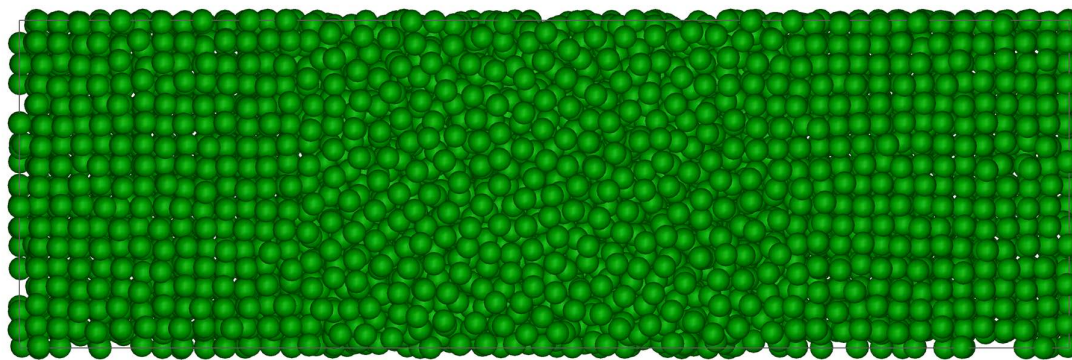


Fig1: Simulated direct coexistence between an FCC crystal (left and right) and a fluid (middle), with interfaces between them. The box is periodic in all directions.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: YES

Quantum Physics: NO

Theoretical Physics: YES