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PhD proposal

Development of microfluidics coupled to PAT tools for screening and the establishment of phase diagram.

Keywords: nucleation / microfluidics / characterization tools / crystals

Elaboration and production of material require development of accurate instrumentation at the laboratory scale. In this PhD project, we aim at developing a crystallization platform with integrated diagnosis tools that can meet shifting demands of scale and product diversity.

A scaled-down platform with integrated PAT (Process Analytical Technology) tools for efficient screening for crystallization conditions, fast establishment of phase diagram and easy transfer from laboratory to pilot scale is still missing.

The candidate will develop a microfluidic platform for high-throughput protein crystallization experimentation, on a highly instrumented installation with video, Raman, UV spectroscopy, and a novel Single Particle Extinction and Scattering (SPES) for in-line monitoring of the solution during crystallization to collect data on the thermodynamics and kinetics. These data will be shared in the consortium to build mechanistic, statistical and Machine Learning (ML) models to describe studied systems.

Specific objectives of the PhD project:

- (i) Develop a microfluidic platform for crystallization studies with online monitoring tools.
- (ii) Measure solubility diagrams and metastable zone.
- (iii) Develop a screening strategy for the identification of crystallization conditions of biomolecules, by using the ML algorithms built by the consortium.

This PhD project is essentially experimental, and so requires work, motivation, meticulousness and inventiveness. The strong supervision reveals the multidisciplinary aspect of the subject, thus requiring organizational skills and autonomy.

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The main thesis laboratory, CINaM, is located on the Luminy campus, in the heart of the [Calanques National Park in Marseille \(France\)](#). Visits are planned to the team of Wim De Malsche at the Vrije Universiteit of Brussels (Belgium), as well as discussion on industrial interest with EOS Milano (Italy).