Title of the thesis	Formulation in the Amorphus STate
Acronym	FAST
Reference number	014

Hosting institution	**Employer**
Université de Lille Website: https://www.univ-lille.fr/home/	Université de Lille Website: https://www.univ-lille.fr/home/
Hosting research unit 1	**Hosting research unit 2**
Name: Unité Matériaux et Transformations Acronym: UMET Identification number: UMR 8207 Address: Université de Lille Bâtiment C6 59655 Villeneuve d'Ascq Website: http://umet.univ-lille1.fr/	Name: Controlled Drug Delivery Systems and Biomaterials Identification number: U1008 Address: College of Pharmacy 3, rue du Professeur Laguesse 59006 Lille, France Website: http://u1008.univ-lille2.fr/
Principal supervisor	**Co-supervisor**
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Thesis information

Keywords	Drugs, solubility, amorphous solid dispersions, plant-based excipients
Abstract	We propose an interdisciplinary PhD thesis located at the interface “physics / pharmacy”. It will benefit from a collaboration between two laboratories of the University of Lille: - UMR CNRS 8207: Unité Matériaux Et Transformations (UMET) - INSERM U1008: Controlled Drug Delivery Systems and Biomaterials. Dr. Jean-Francois Willart (DR CNRS, physicist) and Prof. Juergen Siepmann (pharmacist) will jointly supervise the PhD thesis. This research work is dedicated to the optimization of the therapeutic efficacy of drugs by the manipulation of their physical state. The challenge is to improve the solubility of poorly soluble drugs by producing amorphous solid dispersions of the latter within a polymeric excipient. Poor aqueous drug solubility is a crucial hurdle for the development of innovative medical treatments. In the amorphous (disordered) state, the solubility of a drug is generally substantially higher than in a crystalline state. However, its physical stability is impaired, due to recrystallization during long term storage. The dispersion of the drug at the molecular state within an appropriate polymeric matrix former will overcome this disadvantage. **The main objective** of this project is to explore the relationship between the formulation, the manufacturing process and the performance of the system in terms of physical stability and drug release. The physical stability of amorphous solid dispersions will be determined through a rational approach of physics of materials. This will require a deep physical characterization of amorphous formulations. This will also require the development and the application of efficient methods to determine the solubility line and the glass transition curve of drug / polymer alloys. These methods will be both experimental (X-ray diffraction, calorimetry, dielectric spectroscopy and Raman spectroscopy) and

	digital (COSMO-RS software and Material Studio). This part of the thesis project will be carried out within the team "Molecular and Therapeutic Materials" of UMET. The drug release performances of the amorphous solid dispersions in aqueous media simulating body fluids will be determined for different compositions and various modes of production (e.g., grinding, extrusion, spray drying, lyophilization...) to determine the most appropriate processing and formulation parameters. The innovative amorphous solid dispersions will be processed into administrable dosage forms, e.g. minitablets. Drug release from the latter will be monitored using adequate experimental set-ups and drug detection by High Performance Liquid Chromatography. This part of the thesis project will be realized in the INSERM U1008 laboratory: "Controlled Drug Delivery Systems and Biomaterials". Moreover, the project will benefit from an intersectorial collaboration with the company Roquette which is a global provider of plant-based excipients (starch, polyols…) for the pharmaceutical and biopharmaceutical industries. It will also benefit from an international collaboration with the group of Professor Van den Mooter from the University of Leuven (KU Leuven / Belgium), whose expertise in amorphous dispersion is internationally recognized.
Expected profile of the candidate	University studies of physics (ideally specialized in Soft Matter) or pharmacy (ideally specialized in Pharmaceutical Technology). Capacity to work in a multidisciplinary team. Fluent English skills (written and spoken). Good organizational skills.
Application procedure	The application procedure is detailed on the European programme PEARL website www.pearl-phd-lille.eu. The funding is managed by the I-SITE ULNE foundation which is a partnership foundation between the University of Lille, Engineering schools, research organisms, the Institut Pasteur de Lille and the University hospital. The application file will have to be submitted before April 15, 2020 (10h Paris Time) and emailed to the following address : international@isite-ulne.fr.
Net salary and Lump Sum	A net salary of about €1,600 + €530 per month to cover mobility, travel and family costs.