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Professor, Université Claude Bernard Lyon 1
 DIRECTOR



The Laboratory of Process Control, Chemical and Pharmaceutical Engineering develops research in the fields of process engineering and physical chemistry. Since its creation in 1988, the LAGEPP has effectively worked for the establishment of multidisciplinary research in automatic, process engineering and pharmaceutical technology. It also ensured that researchers involved in these disciplines continue to conduct high-level multidisciplinary research quality. Its objective is to continue working in this direction. This is notably reflected in the permanent staff recruitment strategy for researchers in automatic, process engineering and pharmaceutical technology.

The investigated research covers from fundamental aspects of understanding and modelization of phenomena to products development in several domains such as pharmacy, cosmetics, food and energy... Researchers, teaching and technical staff of LAGEPP laboratory are settled over an area of 1500 m² in the engineering school CPE-Lyon and 200m² in the school of pharmacy of Lyon 1 University. They receive substantial financial support from the Ministry of Higher Education and Research, CNRS, University Lyon-1, National Research Agency, the Auvergne Rhône-Alpes Region, the European Community and industrial partners.

THEMATIC GROUPS

DYCOP

The "Process Dynamics, Observation and Control of systems of conservation laws" team designs and improves efficient, reliable and intensive processes by development of dynamical models. The different phenomena involved in these multi-scale processes are considered: mass and heat transport in heterogeneous and reactive media with moving interfaces and complex chemical and biological reaction network kinetics. Robust models are formulated as port Hamiltonian or input-output contact systems, notably to develop nonlinear control laws based on thermodynamic functions. Control laws for systems of balance equation are developed based on the semi-group theory and Riemann invariants with recent developments for systems with moving interfaces.

SNLEP

The research topic of the "Nonlinear Systems and Processes" team concerns the theoretical development and implementation of tools in order to: Analyze, Modelize, Simulate, Control and Optimize Process Systems Engineering. The theoretical developments are motivated by practical applications encountered through collaborations with industrial and academic partners. More specifically, our work focuses on model design and reduction, parametric identification, observation, diagnosis and control.

GEPHARM

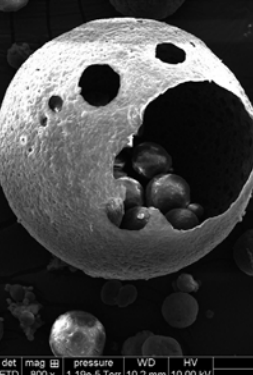
The Pharmaceutical Engineering team designs new formulations containing active molecules, which is the key point to enhance the efficiency. These formulations can be prepared in the form of dispersions, new drug delivery systems (nanoparticles, liposomes, nanoemulsions, Pickering emulsions, microemulsions...) using various processes in order to control the active molecules location and distribution inside the used matrix. The active molecules or the final drug should answer various criteria driven by the application in the pharmaceutical or cosmetic field.

PRODIS

The "Processes in Dispersed Media" team focuses on the study of the processes of production, separation and shaping of solids or emulsions, mainly by drying, spray/freeze-drying, crystallization /precipitation, agglomeration, and polymerization of liquid/gas monomers. The research methodology relies on innovative equipment and monitoring devises (spectroscopy, in situ video probe, fast camera, FBRM, calorimetry) combined to advanced modelling (thermodynamics, population balances, multi-scale models).

| Figures

Left : Emulsification reactor*
 Center : Pilot of a fixed bed *
 Right: Nanoparticles pilot plant
 * Photographe Alexis Chézière



det mag pressure WD HV
ETD 800 x 1.19e-5 Torr 10.2 mm 10.00 kV

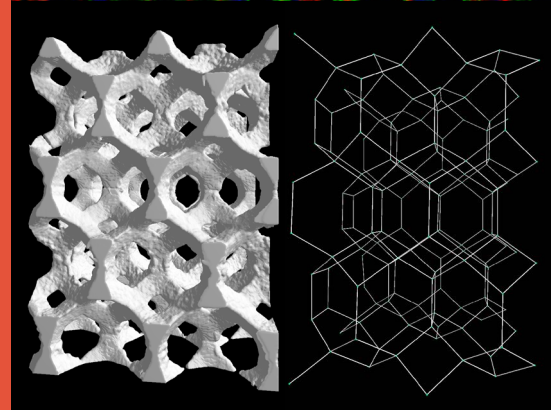
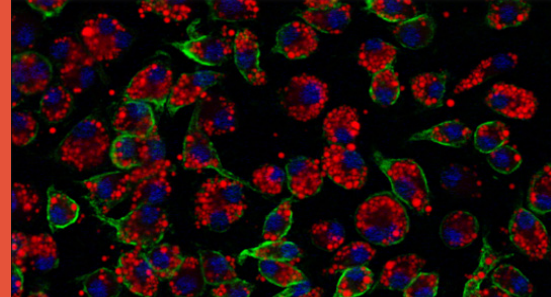


| EQUIPMENT

- > Climatic chamber
- > Crystallization setups from 100ml to 30 litres
- > Microfluidizer
- > Freeze Dryer, Atomizer Pilot
- > 3D-powder mixer
- > Ultracentrifugation
- > DSC, TGA, DVS (dynamic vapour sorption analyzer)
- > Ring shear tester RST-XS
- > Rheometer
- > LC/MS, GPC
- > FTIR spectrometer
- > Zetasizer, Mastersizer
- > Cryomicroscopy
- > In situ probe (video, FBRM,)

| EXPERTISES

- > Crystallization-precipitation-agglomeration
- > Drying (contact, convective), spray-drying
- > Freeze-Drying, wet granulation
- > Pharmaceutical process
- > Control and modeling
- > Control and Observation



COLLABORATIONS

The LAGEPP has numerous collaborations within national and international projects. The funding of these project is obtained through:

- public agencies (ANR, FUI, GGCIS, European Union)
- Industrial partnerships in chemical engineering (IFPEN, CEA, RHODIA, CRISTOPIA, SANOFI, SOLVAY, NEXANS, ARKEMA...),
- Systems and control engineering (IFPEN, CIAT, VOLVO trucks, ADISSEO, TOTAL, BIOMERIEUX, THIMONNIER, ...),
- Pharmaceutical engineering (SANOFI, NOVARTIS, PFIZER, L'OREAL, GATTEFOSSE, STRAND COSMETICS EUROPE, CLARINS...).

KEYWORDS

Encapsulation, Targeting, Nanoparticles, Microparticles, Pharmaceutical technologies, Diagnostic, Therapy, Automatic control, Simulation, Identification, Observation, Fault diagnosis

Separation processes, Chemical reactors, Precipitation, Drying, Freeze-drying, Formulation, Bionanotechnology, Control theory, Software sensor per observer, Model structures, Control and thermodynamics, Dynamic modeling of processes, Inverse methods, Crystallization, Powder flow, Emulsions, Polymers, Modeling, Online monitoring, Cosmetics, Physical chemistry, Medical imaging, Chemometry...

STAFF MEMBERS

Director:

BRIANÇON Stéphanie Professor

Co-director:

TAYAKOUT-FAYOLLE Mélaz Professor

Administrative direction:

CHAPEL Nadia Administrative and Financial Officer

Scientific Council :

JALLUT Christian Professor

Partnership:

ANDRIEU Vincent Junior researcher of the CNRS

Communication:

DOS SANTOS MARTINS Valérie Associate professor

Safety, instrumentation and analysis:

AGUSTI Geraldine and BARRATIER Cynthia Engineers

IT manager:

GARRIGUES Olivier Engineer

SNLEP:

HAMMOURI Hassan Professor

PRODIS:

MANGIN Denis Professor

SHEIBAT -OTHMAN Nida Senior Researcher of the CNRS

GEPHARM:

BOLZINGER Marie-Alexandrine Professor

DYCOPE:

TAYAKOUT-FAYOLLE Mélaz Professor

PITAUULT Isabelle Junior researcher of the CNRS

ANDRIEU Vincent Junior researcher of the CNRS

MEMBERS

Permanents :

55 with

40% Professors/Directors of research of the CNRS and 60% Assistant professors/Junior researchers of the CNRS

Non permanents:

4-6

Post-Docs

40-45

PhD Students

15-20

Graduate Students/years

CONTACT

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| Figures

Left, top: Polymeric microparticles & Filtration cell

Left, bottom : Freeze dryer Cryonext*

Right, bottom: Tomographic scan of Kelvin Cell

(left) and its representative solid graph (right)

obtained using iMorph software

Right, top: Nanoparticles in tumoral cells

* Photographe Alexis Chézière



Hébergeant :

