

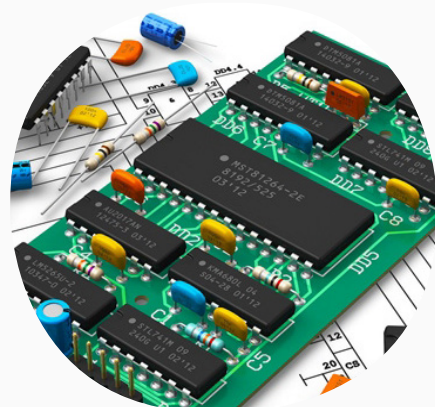
The Reactions and Chemical Engineering Laboratory is a joint unit of the CNRS (National Center for Scientific Research) and the University of Lorraine. It is mainly attached to the Institute of Engineering and Systems Sciences (INSIS) and secondarily to the Institute of Chemistry and the Institute of Ecology and Environment of the CNRS as well as to the EMPP pole (Energy, Mechanics, Processes, Products) of the University of Lorraine.

**LRGP HAS WELL EQUIPPED AND PERFORMING TECHNICAL SERVICES,
OPERATED BY HIGHLY QUALIFIED PERSONNEL,
ABLE TO RAPIDLY RESPOND TO THE NEEDS OF RESEARCH**

The design, construction and optimization of the experimental equipment and prototypes developed by the researchers is done in narrow cooperation with the **Mechanics Workshop, the Electronics Workshop, the Coordination of Analytical Tools**, and the **Computing and Networks Service**.

At all stages of a new project, the Mechanics Workshop relies on qualified people and efficient technical means including:

- A design-office for the pre-design of prototypes (3D-Inventor CAD software) and cost-evaluation,
- Conventional and numerical equipment for machining complex components (e.g. a 4 axes vertical machining center) with a variety of materials, from metals to plastics,
- Soldering and welding equipment TIG,
- Shaping, forming, assembling and glueing plastic materials.



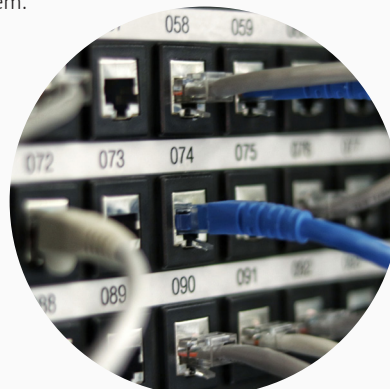
The electronic instrumentation of the devices is managed by a dedicated service which:

- draw up specification,
- designs and fabricates electronic set-ups allowing real-time data processing and control of experiments (mainly associating numerical electronic cards with micro-controllers).
- et conçoit une interface de pilotage informatique de ces ensembles (Labview).

Two independent teams, composed of ITA-BIATOS staff, researchers and teacher-researchers, complete this technical system.

The first one ensures the **Coordination of Analytical Tools** and the maintenance of the vast analytical park (particle analyzers, chromatographies, spectroscopies, microscopes, rheometers, imaging equipment...)

Networks, Administration, Computing, Programming service ensures the development, maintenance and renewal of the more than 600 connected computers and cluster, manages the servers and associated software and develops new calculation and simulation software.



Permanent or contractual staff benefit from a privileged environment including 9 000 m² of premises spread over 3 sites: the Grandville site (ENSIC) which is the main site and two sites dedicated to biotechnology on the plateau of Nancy-Brabois, on the premises of ENSAIA and the Science du Vivant et Santé platform.



SITE ENSIC

1, rue Grandville
BP 20453
54001 Nancy Cedex - France
Tél +33 (0)3 72 74 36 00



SITE ENSAIA

2, avenue de la forêt de Haye
TSA 40602
54518 Vandoeuvre-lès-Nancy
France
Tél +33 (0)3 72 74 40 00



SITE PLATEFORME SCIENCE DU VIVANT ET SANTÉ

13, rue du bois de la Champelle
54500 Vandoeuvre - France
Tél +33 (0) 3 83 37 28 17

FOR PROJECTS WITH INDUSTRY OR WITH PUBLIC COLLECTIVITIES LRGP INTERACTS WITH PROGEPI AND EARNED THE CARNOT LABEL OF EXCELLENCE

AN OPERATIONAL PARTNER

A technology transfer center
PROGEPI



PROGEPI offers R&D services in processes, energy and environment. It has a staff of full time dedicated engineers, has access to the equipment and facilities of LGRP, and to the expertise of the researchers.

The collaborations may be in the form of experimental tests, equipment design, technological survey, numerical simulation studies, chemical analyses, consulting sessions.

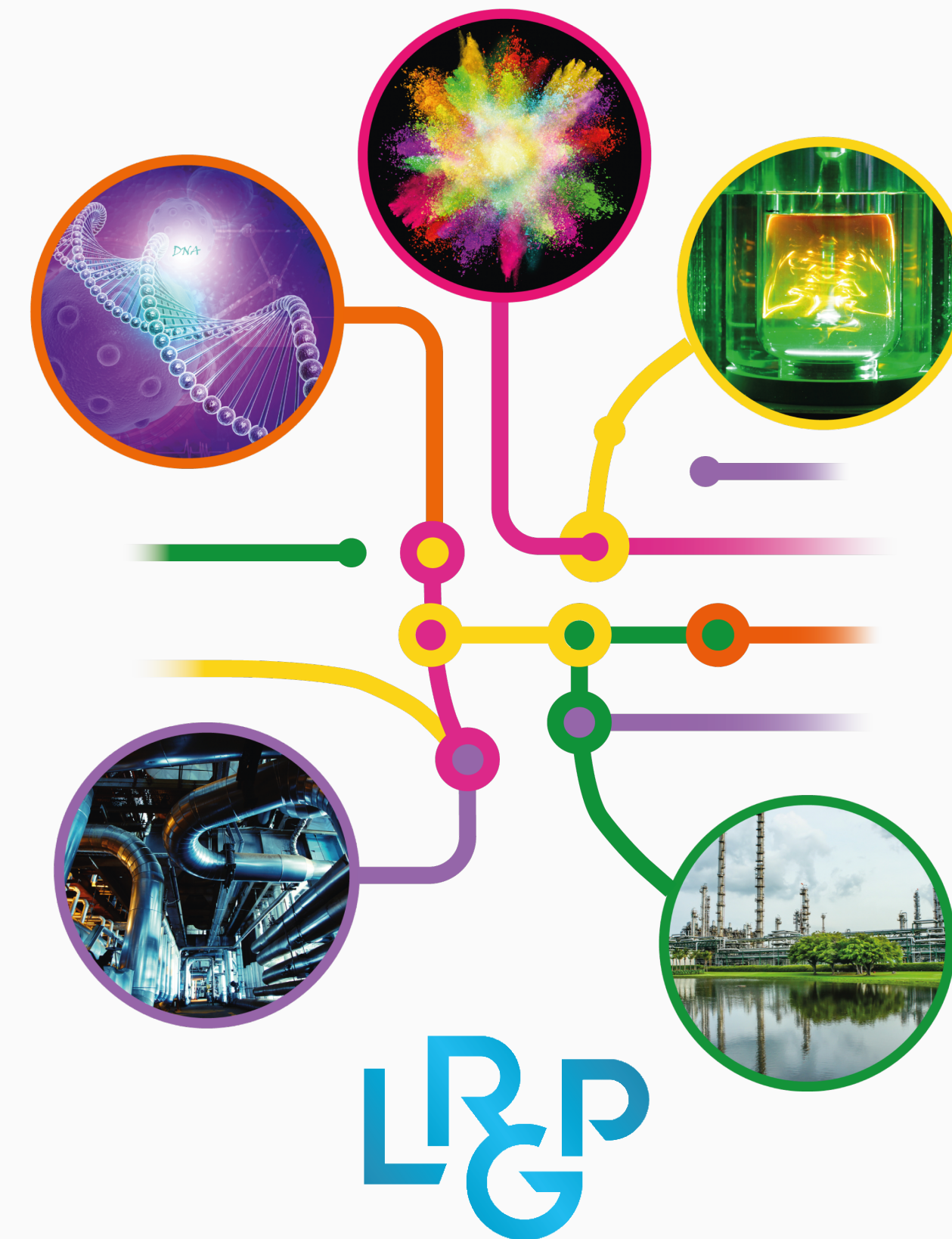
LABEL OF EXCELLENCE

Le Carnot ICÉEL



ICÉEL supports the development of clean and safe, energy efficient processes, for an optimal use of energy resources and for the design of innovative materials and intelligent products it aims to promote their socio-economic transfer.

Founded in 2007, ICÉEL can rely on the scientific, technological and human skills of 27 laboratories, technical centres and transfer centres, enabling it to propose an interdisciplinary partnership research offer.



LRGP

REACTIONS AND CHEMICAL ENGINEERING LABORATORY

UMR7274 CNRS-UL
NANCY



UNIVERSITÉ
DE LORRAINE



The Laboratory of Reactions and Chemical Engineering develops the scientific and technological knowledge necessary for the synthesis and recycling of materials and functional products, through chemical, physico-chemical and biological processes and the design, the optimization and the control of the elaboration processes and the related transformation of mass and energy.

LRGP IS ORGANIZED ALONG FIVE MAIN THEMATIC LINES

COMPÉTENCES

ÉQUIPEMENTS PRINCIPAUX

PERSEVAL

Processes for Environment, Safety and Resource Valorization

Aerosols and safety:
Metrology, separation (filtration and alternative processes), explosion of solid, liquid and hybrid mixture aerosols

Study of the dissemination and treatment of pollutants and micropollutants in water and soil

Electrochemical processes for energy production and treatment of aqueous effluents (fuel cells, fuel cell-supercapacity hybridization, advanced oxidation processes, etc.)

Valorisation des ressources secondaires et recyclage (hydrometallurgie, agromine...)

Characterization of multiphase Flow and G/L and G/S Interactions in Water Treatment Processes

Life Cycle Analysis and Environmental Process Analysis

Multicomponent absorption, optimization of adsorption/desorption cycles

Water treatment plant modelling and simulation

Pilots for the transport and treatment of pollutants in the soil (GISFI platform)

Aerosol characterization platform (particle size, electrical load, etc.)

Dust explosion platform (20 L sphere, etc.)

Multi-channel potentiostats, pressure impedance spectroscopy

Particle Image Velocity (PIV)

Ultra-fast high resolution cameras

Water analysis platform (micropollutants, rare earth elements, etc.)

On site qualification of rivers by dedicated equipments

PRIMO

Processes, Reactors, Intensification, Membranes, Optimization

Intensified processes and microstructured systems

Membrane materials and processes for molecular separations (gas, liquid, vapour)

Optimal experimental strategy for model identification, model discrimination and optimal planning

Real-time process optimization

Optimal design of multifunctional coupled or hybrid processes

Heat flux calorimeter

Modular setup of microstructured reactors

FTIR, GC TCD-FID, ATG, DSC, rapid visible light and IR cameras

Gas permeation experimental plants, pervaporation and membrane contactors

Time-Lag Apparatus

Organic Nanofiltration

BIOPROMO

Bioprocesses, Biomolecules

Bioproduction process engineering:
Animal cell culture processes in reactors
Enzymatic processes
Non-food application of microbial processes
Interaction between biology and hydrodynamics in a reactor
Innovative methods of online analysis

Bio-separation process engineering and molecule functionality:
Protein Agro-Resource Biorefinery
Enzymatic functionalization of peptides
Photosensitizers for photodynamic therapy

Multi-scale digital engineering of bioprocesses:
Planification, modelling, simulation, multi-criteria optimization, extrapolation

Instrumented and controlled bioreactor platform:
Fermenters, mini-bioreactors, microfluidics, high pressure, reactive extrusion ...

Biomolecules separation platform:
Membrane pilots, chromatography, concentration/drying

Biomolecules and cell analysis platform:
UV-Vis absorption, molecular fluorescence,...), liquid chromatography and capillary electrophoresis coupled with mass spectrometry

Computer stations, software:
Molecular and mesoscopic modelling, CFD, chemometry

CITHERE

Kinetics and Thermodynamics for Energy and Products

Radical reaction kinetics

Experimental studies, development of detailed and lumped mechanisms, and detailed kinetic modelling of gas-phase oxidation and pyrolysis reactions of fossil hydrocarbons and bio-fuels

Theoretical kinetics applied to the study of reaction mechanisms

Thermochemical transformation of lignocellulosic biomass for the production of chemicals and biofuels

Development of biomass pyrolysis, gasification and liquefaction reactors

Reactor, process and biomass-waste-energy modelling

Advanced thermodynamic models (EOS, molecular simulation) for the calculation of physical properties and phase equilibria

Product-Design approach for the optimization of energy transformation processes

Laminar flat flame burners

Ideally mixed CSTR for gas phase study up to 10 bars

Shock wave tube

Multi-phase reactors with high hydrogen pressure (150 bar)

Laser induced pyrolysis of solids

Biomass gasification fluidized bed (3 kg/h)

Online analysis of gases, tars and pollutants by mass spectrometry

GC*GC/MS, LC/MSGC-FID/TCD/MS and CRDS

Equipment for critical point determination

Ebulliometer

GÉNIE DES PRODUITS

Processes for Products and Materials

Processes for the development of multi-structured products and materials with complex and evolving rheology, with properties and functions of use, including in particular:
Synthesis and recycling of polymers and polymer matrix composites by reactive extrusion

Crystallization and precipitation for the purification and synthesis of divided solids

Synthesis of functional nanoparticles

Mixing, formulation and rheology of powders

Micro-compounder

Mono and bi-screw extruders

Instron Press

Parr reactors for hydrothermal or high pressure synthesis

Fluidized bed reactor (L-S)

Stress imposed and strain imposed rheometers

Rheo-reactor at high temperature and pressure

Powder rheometers with controlled humidity

Atomic force microscope

Contact angle, DWR

OUR OBJECTIVE

Respond to the societal stakes through more sustainable green and safe plants with:

Increased process efficiency through better management of matter and energy fluxes
Decreased ecological footprint
Environment-friendly products and materials
Integrated economic and social criteria

OUR STRENGTH

A multi-scale and integrative approach going from the detailed analysis of elementary phenomena all the way to process design.

KEY FIGURES

The LRGP has more than **300** employees including:
120 CNRS researchers and teachers
50 personnels techniques et administratifs
200 non-permanent staff, i.e. PhD students, M.Sc. internships... /year


The LRGP's activity develops through :
2 millions euros contracts /year
200 participations in national and international congresses /year
140 articles in peer-reviewed journals /year
30 defended PhD (for **82** doctoral students registered)
4 joint laboratories (Air Liquide, EDF, INRS, INERIS)

FIND OUT MORE

Find our White Papers (Technical platforms...) in the communication tab of our website:

 <http://lrgp.cnrs.fr/>

Follow us on LinkedIn:

 <https://fr.linkedin.com/company/la-boratoire-r-actions-et-g-nie-des-proc-d-s>

Contact us at :

 lrgp-contact@univ-lorraine.fr

TRANSVERSE ACTIVITIES

Hydrometallurgical processes for the exploitation of metal resources
CO2 capture and recovery processes
Biorefinery processes and products

Numerical simulation of multiphase and reactive complex flows (CFD) for chemical and biological separation and transformation