

Equipe Ingénierie et Architectures Macromoléculaires

de l'Institut Charles Gerhardt de Montpellier : des méthodologies de synthèse aux matériaux.

Présents aux RNJP 2015:



C. BOUILHAC



P. LACROIX
DESMAZES



V. LADMIRAL



V. LAPINTE



J. PINAUD

UMR 5253 - CNRS, UM, ENSCM



Who are we?

Materials



**Institut Charles
Gerhardt, Institut
de Chimie
Moléculaire et des
Matériaux**

UMR 5253 CNRS/UM/
ENSCM

*Director Jean-Marie
Devoisselle*

Biomolecules



IBMM
Institut des
Biomolécules
Max Mousseron

**Institut des
Biomolécules Max
Mousseron**

UMR 5247 CNRS/UM

Director Pascal Dumy

Membranes



**Institut Européen
des Membranes**

UMR 5635
CNRS/ENSCM/UM

Directeur Philippe Miele

Separation



**Institut de Chimie
Séparative de Valrhô au
CEA de Marcoule**

UMR 5257
CNRS/UM/CEA/
ENSCM

Directeur S. Pellet-Rostaing

The Institute for Molecular Chemistry and Material Sciences in Montpellier (UMR CNRS 5253) constitutes, along with the European Institute for Membranes, the Institute Max Mousseron for Biomolecules, and the Institute for Separative Chemistry in Marcoule, a network of chemistry institutes known as the Balard Pole of Chemistry (Pôle Chimie Balard). The Institute Charles Gerhardt of Montpellier, which is funded by the National Center for Scientific Research (CNRS) and the French Ministry for Education and Research, is composed of 11 research groups comprising about 230 permanent researchers and an average of more than 180 Ph.D. students and postdoctoral researchers.

Institute of Molecular Chemistry and Material Sciences in Montpellier

11 teams / 230 permanent researchers / 180 Ph.D. students and post-docs,
Director: J-M Devoisselle, <http://www.icgm.fr>

The research at ICGM is oriented towards three main topics

Topics

From the molecule to materials : molecular chemistry, macromolecular and supramolecular chemistry, self-organization, nanostructuration, hybrids, nano materials.

Advanced materials : applications for energy, environment, sustainable development, health.

Modeling : structures, properties and reactivity of molecules and materials



MACROMOLECULAR ENGINEERING AND ARCHITECTURES (Dir: Patrick Lacroix-Desmazes)

24 permanent people: 15 researchers (3 PR, 9 Ass.PR, 2 DR, 2 CR), 9 engineers and technicians (1 IR, 4 IE, 4 Admin. Techn.)

30 non-permanent people (PhD students, Post docs, engineers)

TOPIC 1

Controlled Polymerizations

Topic Leaders:

P. Lacroix-Desmazes
S. Monge

Radical Ionic, ROP

B. Ameduri, O. Giani
P. Lacroix-Desmazes,
V. Ladmiral, V. Lapinte,
S. Monge, J. Pinaud

TOPIC 2

Polymers Bearing Heteroatoms

Topic Leaders:

B. Ameduri
G. David

Fluorine, Phosphorous

B. Ameduri, G. David,
J. P. Habas, V. Ladmiral,
A. Manseri, S. Monge,
C. Negrell-Guirao

TOPIC 3

Polymers, Unconventional Media, Dispersed Media and Self-Assembly

O/N

Topic Leaders:

P. Lacroix-Desmazes
A. Mas

H_2O , sc CO_2 , UV, Plasma

C. Bouilhac, C. Joly-Duhamel,
P. Lacroix-Desmazes,
A. Manseri, A. Mas,
J. Pinaud, J.J Robin

TOPIC 4

Polymers and Composites from Renewable Resources

Topic Leaders:

J. P. Habas, S. Caillol
Lipids, Proteins, Polyphenols Polysaccharides
R. Auvergne, C. Bouilhac,
B. Boutevin, S. Caillol, G. David,
O. Giani, J.P. Habas, V. Lapinte,
C. Negrell-Guirao,
A. Ratsimihety, J.J. Robin

Complementary expertizes : physical-chemistry, rheology, mechanics of polymers

« Ingénierie et Architectures Macromoléculaires » Team

TOPIC 1 Controlled Polymerizations

Actors:



B. AMEDURI



O. GIANI



P. LACROIX
DESMAZES



V. LADMIRAL



V. LAPINTE



S. MONGE



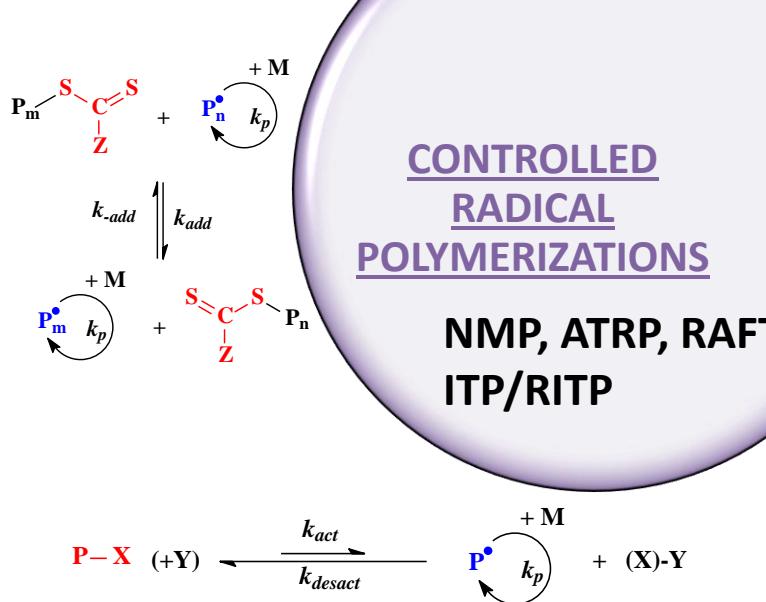
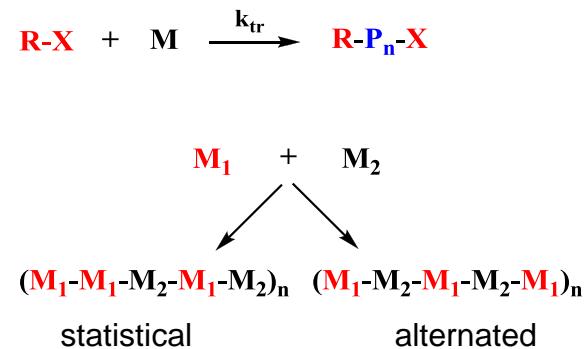
J. PINAUD

TRANSVERSAL TOPIC

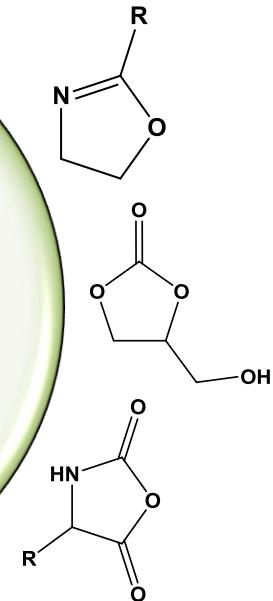
Strengths of the team :

- ✓ Control of the various synthesis tools
- ✓ Particular structures
- ➡ Various applications

CONVENTIONAL RADICAL POLYMERIZATIONS
Telomerization
(Co)polymerization



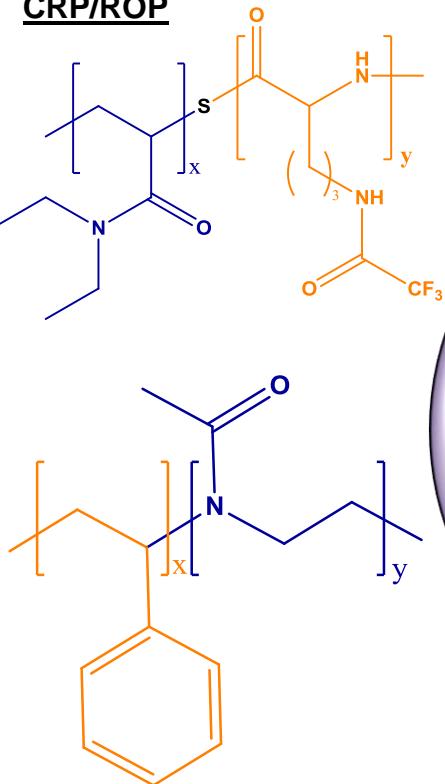
RING OPENING POLYMERIZATIONS
anionic,
cationic,
organocatalysis



Combination of methods : innovative macromolecules

Successive polymerizations

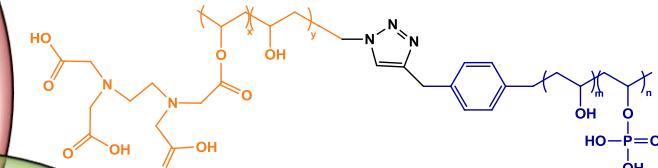
CRP/ROP



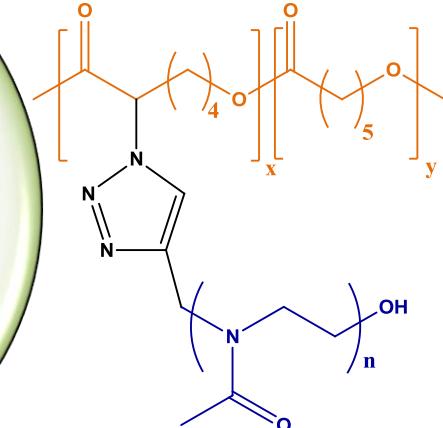
CONVENTIONAL RADICAL POLYMERIZATIONS

CONTROLLED RADICAL POLYMERIZATIONS

« Click » chemistry



Diblock Copolymers



RING OPENING POLYMERIZATIONS

Grafted Copolymers

« Ingénierie et Architectures Macromoléculaires » Team

Topic N°2 **Heteroatom-Based Polymers**

Actors :



B. AMEDURI



G. DAVID



J.P. HABAS



V. LADMIRAL



S. MONGE



C. NEGRELL

Properties of fluorinated or phosphonated polymers

FLUOR

Thermostability
Chemical inertness
Hydrophobic/Oleophobic
UV resistance
Low refractive index

PHOSPHORUS

Ignifugation
Complexation
Adhesion
Amphoteric Character

Issues and scientific challenges

Control of the polymer structure based on F and/or P :

- Specific position of hetero-atoms in the polymer chain
- Complex structures (block copolymers, grafted, dendrimers, ...)

Improvement of physico-chemical properties of polymers based on F and/or P :

- Increase of molecular weights
- Chemical or physical crosslinking

Equipe « Ingénierie et Architectures Macromoléculaires »

Topic N°3 **Polymers, Unconventionnal Media and Clean Processes**

Actors:



C. BOUILHAC



C. JOLY-
DUHAMEL



P. LACROIX-
DESMAZES



A. MAS

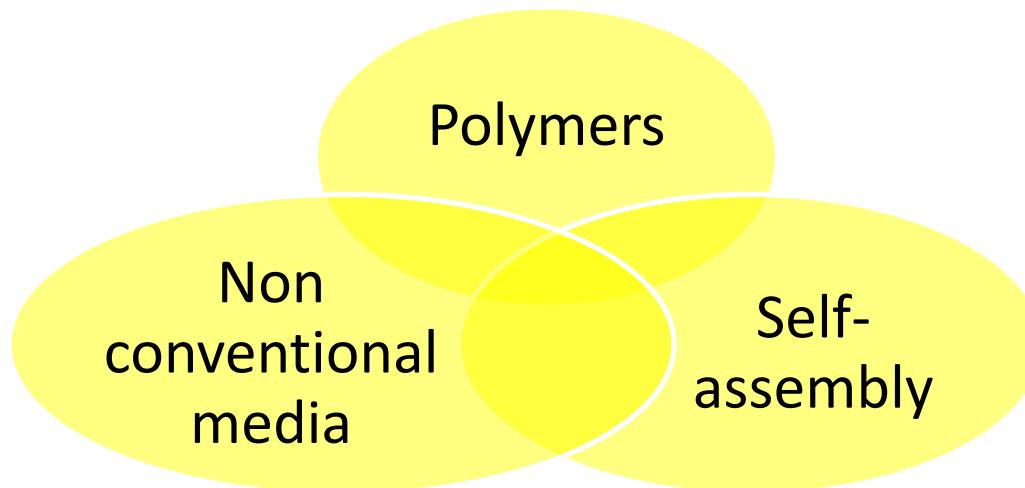


J. PINAUD



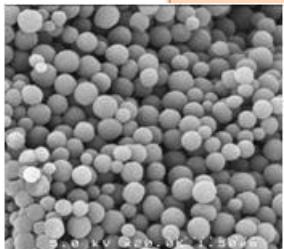
J. J. ROBIN

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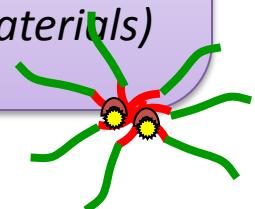
Upward = Synthesis

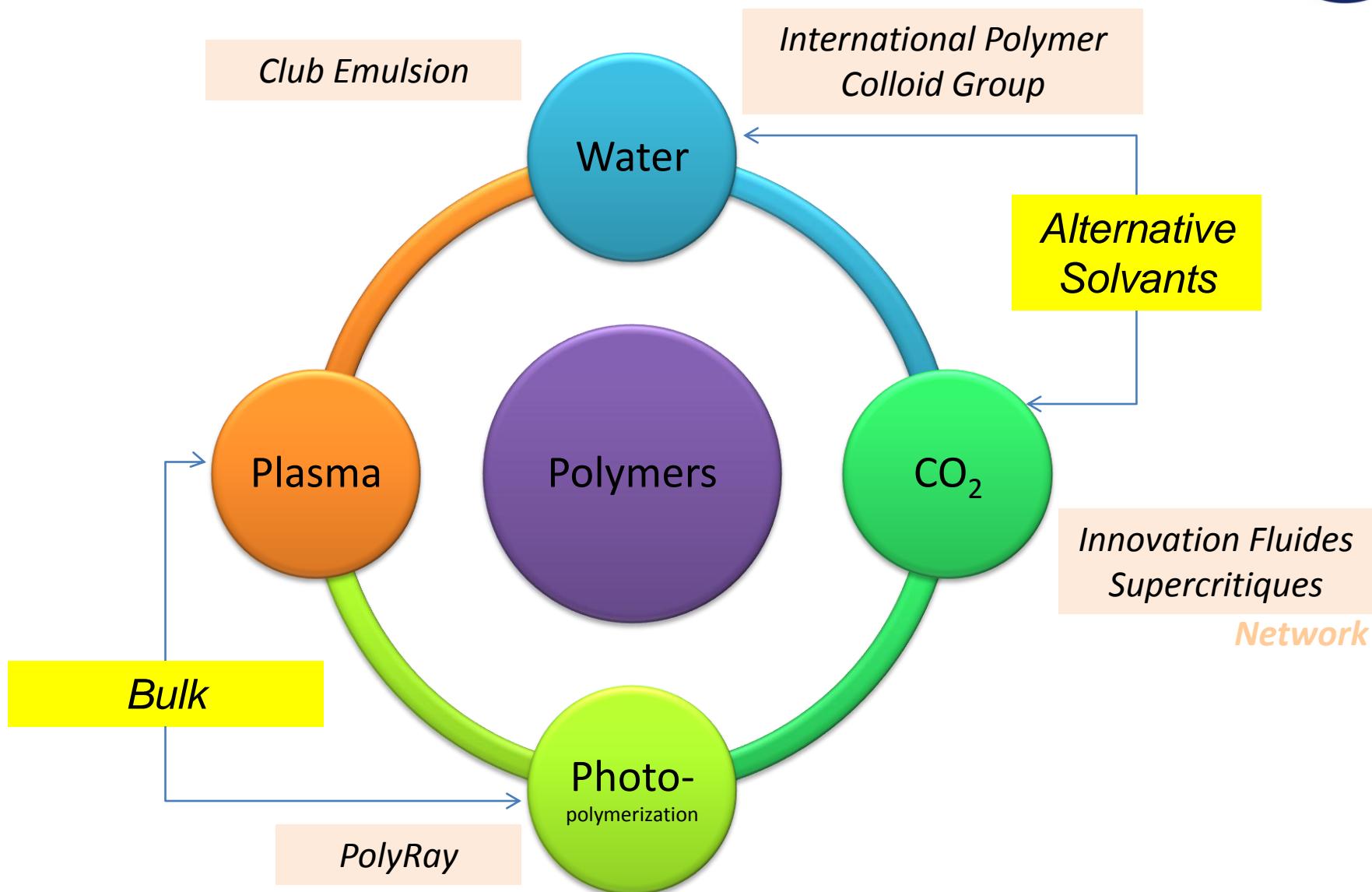
⇒ *Production of polymers using clean processes in non conventional media (scCO₂, water)*
And also :
- photochemistry
- plasma



Downward = Applications

⇒ *Design/use of polymers as additives to develop clean processes in non conventional media (encapsulation, functionalization, extraction, synthesis of nanostructured materials)*





Equipe « Ingénierie et Architectures Macromoléculaires »

Topic N°4

Polymers and Composites based on Renewable Ressources



R. AUVERGNE



B. BOUTEVIN



C. BOUILHAC



S. CAILLOL



G. DAVID



O. GIANI



J.P. HABAS



V. LAPINTE



C. NEGRELL



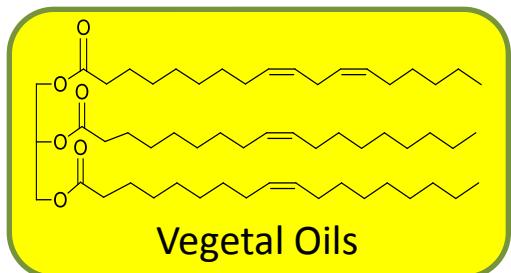
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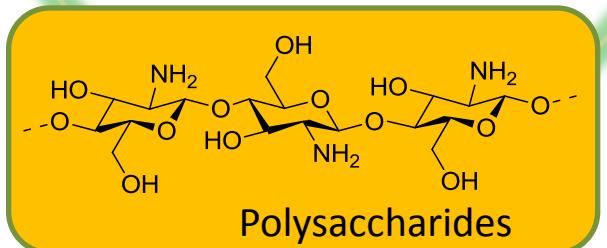
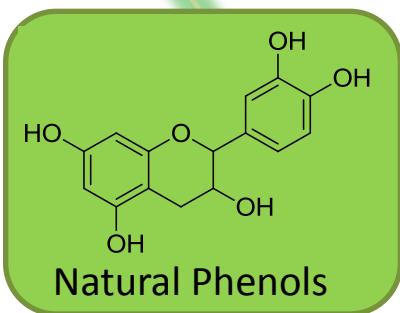


- **DOUBLE SUBSTITUTION:** new building blocks, biosourced and harmless, for the synthesis of polymers
- **PLATFORM APPROACH:** from the molecule to the materials

From MOLECULES ...



... BUILDING BLOCKS ...



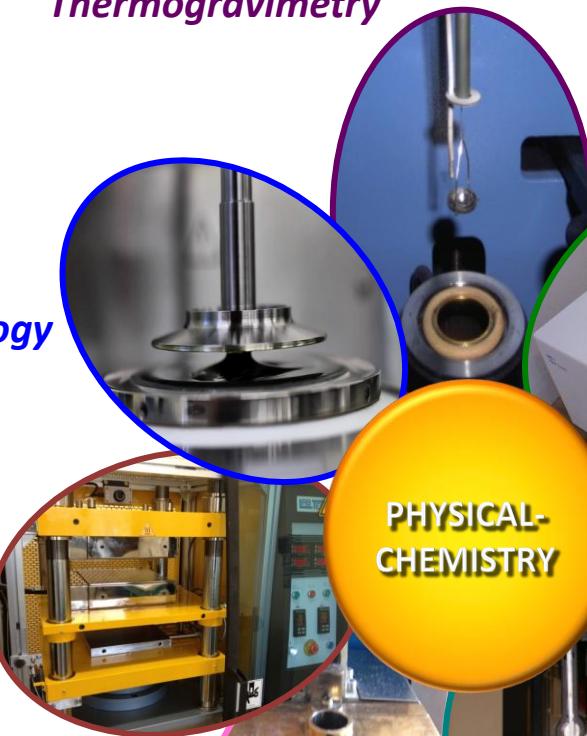
... to MATERIALS



PUs, Epoxy,
Phenolic,
(Meth)acrylics
...



Thermogravimetry



Rheology



Polymer processing



Formulation



Mechanical testing



DMA

Calorimetry



Interaction with macromolecular synthesis

Complementary characterization step

Efficient support for the production of polymers

Institut Carnot CHIMIE BALARD (Axe Valorisation du Labex CHEMISYST)
<http://www.polechimie-balard.fr/rub/116/presentation-institut-carnot-chimie-balard.htm>

Directeur

Jean-Marie Devoisselle

Directeur adjoint - Chimie Durable

Sylvain Caillol

Directeur adjoint - Energie

Frédéric Favier

Directeur adjoint - Santé

Gilles Subra

Directeur adjoint - Communication

Yannick Guari



The banner features the Institut Carnot Chimie Balard logo on the left, consisting of a stylized blue and white wave graphic next to the text "INSTITUT CARNOT CHIMIE BALARD". On the right, there is a large circular graphic containing a collage of scientific images: molecular structures, a researcher at a computer, and various materials like wood and glass. The URL "www.carnot-chimie-balard.fr" is displayed in the top right corner of the banner area.

INSTITUT CARNOT
CHIMIE BALARD

www.carnot-chimie-balard.fr

Les expertises regroupées au sein de l'institut Carnot Chimie Balard permettent une approche intégrative multi-échelle allant de la molécule au matériau puis vers le procédé.

Le cœur de l'activité de recherche de l'institut Carnot Chimie Balard concerne l'élaboration, la caractérisation et l'étude du comportement de molécules et de matériaux de fonctions pour l'énergie, la «chimie verte», la protection de l'environnement et la santé.

Pour nous contacter : contact@carnot-chimie-balard.fr

Labex Chemisyst (ANR AAP2010)
(Ambition à 10 ans – 2020)

Recherche

Nos collègues physiciens

Six associated research units, 120 scientists from 44 research teams active in projet

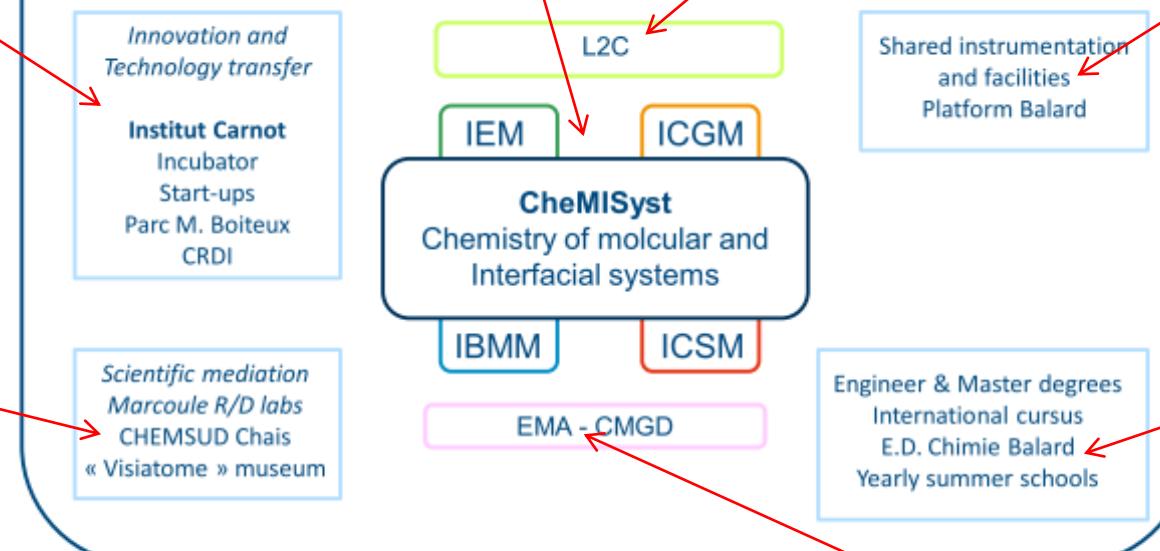
Le Pôle chimie Balard en Languedoc-Roussillon

Valorisation

Instrumentation

Sciences et
société

Formation



Taking in account socio-economic impacts: towards a sustainable chemistry, increasing economy of atom and primary energy able to provide innovation and economic development.

Nos collègues des Mines d'Alès