

Meca.Mat&Pro

Mechanics, Materials and Processes

Three domains of expertise
in synergy for your innovation



The Carnot institutes Meca.Mat&Pro group

A synergy between experts in materials and material implementation for an adapted response in the support of your project.

The “mechanical engineering industries” represent in France the 1st industrial branch, a top exporting one, located at the 6th world rank. To accompany its development, the Carnot network created the Meca.Mat&Pro group which regroups the laboratories in Mechanics, Materials and Processes of the Carnot institutes.

It proposes an integrated R&D offer, readable and accessible, from the development of materials to the mechanical system and its recycling. This unique alliance gathers at the same time a strong human potential and powerful technological means organized around advanced technologies platforms. These laboratories regroup 4000 researchers who daily work on the design, the simulation and the behavior of materials in service to respond to your innovation needs. Each entry point gives you access to the totality of their competences and their means.

TO MEET INDUSTRIAL NEEDS THANKS TO SYNERGIES BETWEEN CARNOT INSTITUTES: SOME EXAMPLES

- In the coming years the composite market is going to shift from thermosetting plastics to thermoplastics. Many sectors of mechanics will be impacted by this evolution. It is capital to master the durability of these materials and the structures made out of them. The Probadur project, involving the Carnot institutes CETIM and M.I.N.E.S and Fraunhofer institutes, establishes the bases of a reliable forecast for the behavior of mechanical welding in long fiber thermoplastic materials (LFTP).

- The CORALIS* project carried out by the CIRIMAT and MIB Carnot institutes proposes a demarche that targets the characterization and understanding of corrosion mechanisms (intragranular/intergranular/exfoliant, under constraint or not) affecting the welded structures made out of aluminum-lithium alloys. This study rests upon the coupling of experimental trials and modeling steps, and sticks to raising current technological bolts in the field of structural lightening. Aeronautics is the prime targeted market.

* : ANR-08-MAPR-0020-05

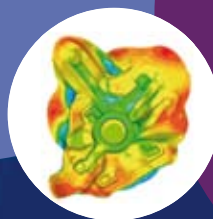
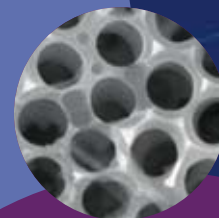
- The integrity of surfaces and the geometrical precision of measurements are a key parameter in the protocol evaluation of uncertainties on tridimensional machine measurements. An original scientific approach, developed within a thesis frame and a partnership between the ARTS and Cetim Carnot institutes, has led to the mastering of the simulation conditions in order to validate the measurement of the object. The first accreditation from the French Accreditation Committee in a gear metrology application has been achieved thanks to this work.



SOLUTIONS FOR THE BIG CHALLENGES OF THE MAIN MARKETS

SOME TECHNICAL CHALLENGES ...

- Lightening of structures: advanced/ composite materials
- Miniaturization/Integration of functions
- High speed manufacturing processes and direct manufacture
- Multi-materials/Assembling/ Functionalisation
- Damage/Operating strength/ Ageing of materials
- Surface treatments/Coatings and corrosion
- Biomechanics and multipurpose biomaterials
- Nanomaterials: design, implementation and toxicity
- Environmentally safe materials and processes
- Recycling and transformation of materials



... FOR SOME MARKETS

Aeronautics and space
Land transportation
Instrumentation
Civil Engineering
Chemistry/Metallurgy
Energy
Health
Environment

OUR COMPETENCES

4000 researchers at your service

MECHANICS AND DESIGN

- Dimensioning (dynamics, fluid mechanics, solid mechanics)
- Prediction of behaviors and damages
- Metrology, control and measurements
- Tribology, friction, wear out, lubrication
- Mechatronics
- Eco-design

PROCESSES, IMPLEMENTATION

- Shaping of the materials (stamping, forging, founding/casting, machining, sintering, ...)
- Plastics technology
- Assembling
- Digital model making, fast prototyping, direct manufacture
- Manufacture, micro manufacture
- Compliance with environmental constraints

MATERIALS

- Design/development of materials
- Coatings and surface treatments
- Properties and characterisation (structural and functional)
- Durability/operating strength
- Nanomaterials

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