

Introducing CROMeP

Established in 1992, the Research Center on Tooling, Materials, and Forming Processes (CROMeP) leads research activities in three main areas :

- Optimization of tools and forming molds, using a multidisciplinary approach (materials science, mechanical engineering, modeling and simulation) ;
- Development of new materials and processes, metals and composites, for automotive and aeronautical industries ;
- Development of novel metrology techniques, based upon non- or weakly intrusive sensors, for dimensional and temperature measurements and for process surveillance.

CROMeP is strongly integrated into higher-level research :

- At the Region level, being a partner of the “Institut Clément Ader” federation of laboratories, being a member of “Institut de Génie Mécanique” research federation, and being a member of “Aérospatiale Valley” competitiveness pole ; CROMeP also participates in four Midi-Pyrénées Region projects and three EPICEA projects ;
- At the National level, being a member of “M.I.N.E.S” Carnot institute, of CNRS research network on Full-field Measurements and Identification in Solid Mechanics, and of EMC2, VIAMECA and AHG ceramics competitiveness poles ; as such, CROMeP participates in seven ANR and three FUI projects ;
- At the international level, through joint doctoral research supervision and as partners in several European projects on tooling and processes.

Most research programs are linked to doctoral research work, in the setting of industrial projects. They mainly address :

- Metal forming processes (hot-forging, die casting, superplastic forming, hot rolling, incremental forming, and heat treatment) ;
- Forming of polymer and composite materials (thermoforming, blow molding, injection, RTM, infusion) ;
- Forming of glass-based materials (pressing, blowing).

Main sectors for industrial applications including aeronautics, and metal, automobile, plastics and glass industries.

SuMO research group (Surfaces, Materials and Tooling)

Activities of the SuMO group are mainly directed towards understanding and describing relationships between the materials microstructure and their bulk and surface common properties.

To that end, this group has developed skills for characterization of metal materials at different scales and under different environmental and thermo-mechanical loadings. In order to complete this experimental approach, a particular attention is paid to the modeling of the materials mechanical behavior (static, cyclic, dynamic, or damage-dependent). Our research activity encompasses materials science and materials engineering, and favors joint experimental and numerical multi-scale approaches.

Current research work falls into three complementary areas :

- Relationship between the materials and surfaces microstructure and their physical and thermo-mechanical properties ;
- Damaging and ageing under mechanical, thermal, and environmental loadings ;
- Development of materials behavior relationships and life prediction.

More precisely, our research concerns martensitic tool steels, precipitation hardening steels, die cast refractory steels, ferritic stainless steels, nickel-based super-alloys, ODS (Oxide Dispersion Strengthened) alloys, and complex thermal barrier systems. Our know-how has been developed while aiming mainly at aeronautical applications, which take a growing part in our activities, but also at energy production, automobile industry and forming tools.

Our scientific work is mostly conducted, in the framework of contract research projects. As examples, we may mention EMOA (AHG competitiveness pole) and Advanced Forming (EMC2 competitiveness pole)

projects, ARCELOR project, on wear modeling of hot-stamping tools, ANR CISBAT, AMARAGE, RamdamAero and Genhstok projects, SITO project, and direct research industrial contracts with FAURECIA, AKERS and NORSKHYDRO.

MaSC research group (Composite Materials and Structures)

Activities of the MaSC group concern :

- Optimization of polymer and composites processes,
- The behavior of polymer, composites and particulate materials.

The process optimization mainly focuses on flow modeling, heat transfer study, and tooling optimization, preferably with implementation on laboratory pilots.

The materials behavior is led from the thermo-mechanical, rheological, and rheokinetic points of view.

The favored approach aims at establishing relationships between microstructures, and fiber and particulate architectures, on the one hand, and common properties of implemented materials, taking ageing into account, on the other hand.

MODT research group (Dimensional and Thermal Optical Measurements)

The MODT group addresses the development of methods and systems for dimensional and/or thermal measurement, with application to the experimental study of materials and structures and to the in-duty surveillance of tools and processes.

Our activities concern :

- The measurement of kinematic fields (shapes, displacements, strain) and parameter identification ;
- The development of Bragg grating optical fiber sensors ;
- The measurement of temperature and thermal data fields ;
- The measurement of true temperature in the near-infrared.

Our work addresses preferably the development of methods for contact-less measurement and the measurement of fields (as opposed to single-point measurement methods). They are based upon optics and imaging techniques (camera-based methods).

Our group participates actively in the national CNRS research network (GDR 2519) on “full-field measurements and identification in solids mechanics”, and especially in its 3 working groups on Metrology, Identification and Thermography.