MATERIALS TECHNOLOGIES

ADVANCED CHARACTERIZATION AND DESIGN OF MATERIALS AND PROCESSES

MULTISCALE TESTING OF MATERIALS AND STRUCTURES
- Analysis of faults and failure mechanisms
- Experimental testing of structures
- Multiscale analysis of mechanical properties of materials and coatings
- Static/dynamic tests at high temperatures

CHEMICAL AND FUNCTIONAL CHARACTERIZATION
- Advanced characterization of polymers, metals, ceramics and composites
- Nanoscale analysis of surfaces and reactivity
- Corrosion and fire resistance studies
- Toxicology, microbiology, biofilms and biodegradation
- In vitro and in vivo studies of implants

SIMULATION AND MODELLING
- Processing simulation and time optimization
- Product design and prototyping
- Simulation of structures and construction processes
- Finite element analysis, computational plasticity and nanomechanics
DEVELOPMENT OF MATERIALS

PROCESSING
- Light alloys and metal matrix composites: powder metallurgy, casting, forging, forming, extrusion and lamination
- Polymers injection, extrusion, mixing, foaming, additives and recycling
- Metal-polymer hybrids and advanced joining techniques
- Functional coatings, textiles and composites materials

MATERIALS PROTECTION AND SURFACES
- Coatings for corrosion, wear and thermal protection
- Thermal/acoustic insulation
- Fire-retardant polymers
- Plasma modification for biocompatible/antibacterial surfaces

ADVANCED MANUFACTURING
- 3D printing, stereolithography, selective laser sintering
- Deposition of micro and nanometric layers
- Nanostructured materials and nanoparticles
- Advanced monitoring processes and quality control (spectral technologies, artificial vision)
MATERIALS

BIOMATERIALS
Tissue engineering, orthopedics and implants
- Osteinductive, bioactive and antimicrobial materials
- Foams, hydrogels, nanoparticles and multifunctional coatings
- Ca/Mn phosphate cements
- Ti, Cr, Co and Ni-free alloys

COMPOSITES
Performance, lightweight and multifunction
- Metal, polymer and ceramic composites
- Nanoreinforced thermosets and flame retardant composites
- Nanomaterials
- Steel, concrete and composite bridges and infrastructures

POLYMERIC MATERIALS
Lightweight, energy/thermal management and bio
- Fire-retardant and conducting composites
- Biocomposites, biodegradable polymers and recycling
- Phase change materials and thermal dissipation
- Photosensitive formulations

TEXTILE MATERIALS
Biotechnology, smart textiles and advanced fabrics
- Integral development of textile prototypes and equipment
- Addition of functional microcapsules on textiles
- Bio-textiles and lignocellulose materials

ADVANCED MATERIALS
High performance, extreme conditions and construction
- Duplex stainless steel, tool steels, and hard materials
- Light alloys, Ni-superalloys, Ti and Cr alloys
- Protective coatings (thermal, wear and corrosion)
- Fire resistance and special concrete materials and structures

FUNCTIONAL MATERIALS
Energy production, environment and detection
- Nanomaterials for catalysis and devices for fuel production
- Organic solar cells
- Environmentally friendly construction materials
- Materials for water treatment and substances detection
SECTORS

**TRANSPORT**
- Extreme conditions and environments
- Weight reduction and energy efficiency
- Fuel economy and emissions reduction

**ENERGY PRODUCTION AND STORAGE**
- Energy conversion, harvesting and storage
- Renewable energy sources and fuels
- Fission and fusion energy

**CONSTRUCTION**
- Sustainable constructions materials
- Life-cycle analysis and recycling
- Energy efficient and environmentally-friendly buildings

**CIRCULAR ECONOMY AND ENVIRONMENT**
- Waste optimization, valorization and water treatment
- Reuse and recycling of used products
- Dosimetry and detection of toxic and explosive agents

**BIOTECHNOLOGY**
- Packaging and smart systems
- Biomass-based composite & processing
- Cosmetics

**HEALTHCARE**
- Tissue engineering and bone regeneration
- Dental, ophthalmic, orthopedic and cardiovascular implants
- Drug-delivery, surgical suture, therapeutics

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