



NAME : DEPARTMENT OF MATERIALS AND PRODUCTION ENGINEERING

INSTITUTION : UNIVERSITY OF NAPLES “FEDERICO II”

COUNTRY : ITALY

Profile :

The Department of Materials and Production Engineering (DIMP) of the University of Naples Federico II is recognised as a leading European academic institution in the field of Material Science and Engineering. The DIMP co-ordinates research in various areas spanning from inorganic to organic (macromolecular materials) for both basic science and industrial application. The research concerns all aspects of the relationships between composition, structure, processing and properties of materials. More than 200 person, including 50 professors (permanent staff) and more than 150 researchers are working in the Department. A strong interactive network between the DIMP, CRIB (Interdisciplinary Research Centre in Biomaterials University of Naples), and IMCB (Institute of Material Composite and Biomaterials, of Italian Research Council CNR) other international institutions (IRC in Biomedical Materials, University Polytechnica de Catalunya, Barcelona, Spain) and many materials companies exists, ensuring the effective transfer of technical results to solve technological problems.

Projects within the DIMP involve both basic science and novel technological development. DIMP has been and is coordinator of several joint multidisciplinary national and international research projects and builds a platform for consulting / discussion regarding the vision on education and research in the field of materials science.

Activities :

- Education in the field of materials science and technology : general training activities, but also specialised continuing education and organisation of workshops and conferences with regard to modern developments in materials science.
- Research and development in the field of materials science and technology and the industrial applications on doctoral and post-doctoral level : applying research results in order to obtain material developments leading to products with a high added value; materials innovation. Stimulating the interdisciplinary and multidisciplinary research (properties, structure, applications, processing, modeling, ...) in order to develop new materials, find new applications, optimisation of materials, ...
- Service providing to the industry : offering a performant research infrastructure and research logistics, including scientific services; technology transfer in general.

Expertise on following materials :

- Metals and metal alloys,
- polymers
- (bio)polymers,
- biomaterials
- biodegradable materials
- textiles,
- ceramic materials,
- glasses and glass-ceramic materials
- microporous and mesoporous materials

- composites,
- cement-based materials,
- electronics,
- semiconductors,
- non-linear optical materials
- woods and wood based materials
- coatings
- biofilms
- chemicals
- magnetic materials
- catalysts
- sensors

Actual research domains concerning materials technology / Competences :

- **Polymers :**
 - Rheology of polymers melts and blends
 - Transport properties of gases in polymer films
 - Mechanical and dynamic-mechanic properties of polymers and polymer composite
 - Development of novel materials and technology for food packaging
 - Development and optimization of thermoplastic polymer processing
 - Development and optimization of natural polymers processing
 - Development and optimization of thermosetting polymer processing
 - Development and optimization of microwave based technology for thermosetting polymers
 - Development and optimization of polymeric hydrogels
 - Development and optimization of polymeric foams
 - Development and optimization of polymeric fibers and nanofibers
 - Development and optimization of polymeric micro and nanobeads
 - Development and optimization of polymeric sensor and actuators
- **Composites**
 - Development and optimization of polymer fiber composite
 - Development and optimization of polymer nano composite
- **Biomaterials**
 - Development and optimization of polymer based scaffolds
 - Development and optimization of novel technology for rapid prototyping of biomaterials
 - Development and optimization biomaterials for intervertebral disk replacement
 - Development and optimization of biomaterials for bone replacement
 - Development and optimization of material and process for total hip replacement
 - Development and optimization of biomaterials for soft tissue replacement
 - Development and optimization of biomaterials for dental applications
 - Development and optimization of biomaterials for cardiovascular application
 - Development and optimization of polymeric drug delivery devices
 - Development and optimization of polymer fiber composite
 - Development and optimization of bioactive ceramics
- **Ceramics**
 - Production and characterization of ceramic materials,
 - Production and characterization of blended cements and concrete
 - Characterization and decay evaluation of cultural heritage materials;

- Synthesis and characterization of mesoporous and microporous materials;
- Characterization and exploitation of natural zeolites;
- Soil rebuilding, amelioration and decontamination;
- Environmental application of natural and synthetic zeolites: ion exchange and adsorption;
- Vapour phase separation by selective adsorption on micro- and mesoporous materials
- Nucleation and crystal growth in inorganic glasses
- Glass structure
- Nanostructuring
- Sol-gel synthesis
- Glass-ceramics from fly-ash
- Electrical properties of materials
- Bioactive ceramics
- Nanoparticles

Metallurgy and Microscopy

- Metals and composites micro and macro structure characterisation
- Products and materials defectology evaluation
- Fractography
- Chemical composition measurements
- Optical analysis
- S.E.M. analysis

Metrology and Reverse Engineering

- Surface Characterisation
- 3D Metrology through CMM
- Contact and non-contact Reverse Engineering
- Non-destructive testing and evaluation (ultrasonic, magnetic, eddy current, liquid penetrants, acoustic emission, etc.)
- 3D ultrasonic inspection through robot systems

Mechanical Characterisation

- Static and fatigue characterisation at different temperatures
- Micro and macro hardness measurements
- Impact behaviour
- Wear characterisation of materials

Material Processing

- Advanced sensor monitoring of material processing technologies
- Metals and composites machining and data acquisition
- Liquid molding for polymer composites
- Sheet metal forming
- Wire drawing and rolling processing
- Conventional and non conventional welding techniques
- Numerical simulation of metal forming
- Rapid prototyping
- Laser marking
- Composites HS drilling
- Composite materials processing: filament winding, autoclave molding, press molding, hand lay-up



Production Management and Engineering

- Logistics
- Operations Management
- Services Management
- Security and safety
- Simulation processes
- Maintenance
- Quality management

Available research infrastructure :

One of the objectives of DIMP is the development of a common research infrastructure that can be used by all members. In addition each researcher has at its disposal a wide range of equipment and techniques necessary for the execution of the research mentioned above. An overview of the research infrastructure available can be found through the DIMP website

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