

**NAME : INTERDEPARTMENTAL MATERIALS SCIENCE AND ENGINEERING CENTER (CISIM)**

**INSTITUTION : UNIVERSITY OF PISA (UNIFI)**

**COUNTRY : ITALY**

**Profile :**

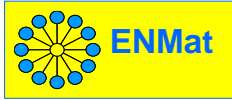
CISIM is the Interdepartmental Materials Science and Engineering Center, combining the multidisciplinary knowledge about Material Science at University of Pisa. It consists of 9 Departments, belonging to the Engineering, Chemistry, Physics, Geology, Biology and Medicine areas, co-working at an interfaculty and multidisciplinary level. More than 90 researchers (full professors, associate professors and researchers) take part to the activity of the Centre. CISIM has the mission of fostering collaborative, interdisciplinary research and education in the science and engineering of materials. CISIM promotes collaboration among UNIFI faculty and between UNIFI faculties and researchers of other universities, industry, and government laboratories.

**Activities :**

- Education in the field of materials science: general training activities, but also specialized continuing education and organization of workshops and conferences with regard to modern developments in materials science. In addition, education activity devoted to companies personnel.
- Research and development in the field of materials science for a wide range of industrial applications; Innovation in material preparation, processing and characterization; Stimulating the interdisciplinary and multidisciplinary research (properties, structure, applications, processing, modeling) in order to develop new materials, keeping into account performances and environmental features.
- Services to industry: offering a research infrastructure to companies and promoting technology transfer and innovation in the material processing technology and final applications.

**Expertise on following materials :**

- metal alloys
- polymer blends and composites
- ceramic matrix composites
- biomaterials
- photochromic and photoactive materials



- Metallic and metallic complexes and oxides
- Light-harvesting biohybrid (protein-based composite) materials
- Synthetic polymers (thermoplastic, elastomers and resins)
- Biopolymers (proteins and peptides) and biomaterials;
- nanoparticles, nanotubes and nanocomposites (organic-inorganic hybrids and composites);
- dyes and active chromophores
- food materials
- pharmaceuticals
- liquid crystals
- metal and magnetic nanocatalysts
- plasmonics materials;
- optical active organics materials;
- liquid crystalline polymers
- supercooled liquids
- active pharmaceutical ingredients
- mono- and poly-saccharides
- polymer nanocomposites
- nanofibers
- proteins
- porous materials (including rocks)
- marbles
- Ultrasound transducers
- Mechanotransducers
- Plaque phantoms

### **Actual research domains concerning materials technology / Competences :**

#### **Department of Civil and Industrial Engineering (DICI)**

- Preparation and properties of ceramic matrix composites.
- Preparation and properties of polymer composites and nano-composites
- Employment of materials and polymers from renewable resources and recycling
- Energetic polymers and polymers for storing hydrogen
- Bituminous materials for asphalts
- Testing methods for mechanical properties of materials for structural and aerospace applications
- Tissue engineering
- Dosimetry
- Tribology and biotribology
- Microstructural and damaging analysis

#### **Department of Energy, Systems, Territory and Building Engineering (DESTEC)**

- Geomaterials
- Natural based material and innovative building structures

#### **Department of Information Engineering (DII)**



- Electronic and robotics applications
- Electromagnetic devices
- Biomedical devices

### **Department of Chemistry and Industrial Chemistry (DCCI)**

- Computer simulation of photochromic and photoactive materials;
- Preparation of solid solutions of metal oxides / Synthesis and structural characterization;
- Study of binders and binder interactions with pigments in cultural heritage materials by thermal analysis;
- Study of alkyd colors used in modern and contemporary art by spectroscopic (FTIR) and thermal analyses;
- Physico-chemical characterization of ultrasmall superparamagnetic nanoparticles;
- Structural studies of loaded halloysite nanotubes;
- Study of structural properties of materials at a molecular/supramolecular level
- Study of phase properties of materials and miscibility in heterogeneous systems
- Study of molecular dynamics of materials
- Study of the electro-optical response of polymers towards external stimuli (temperature, light, stretching)
- Solvothermal and microwave-assisted nanocatalysts syntheses (mainly based on Pd, Ru, Pt, Cu, Rh)
- Green and cheap new industrial catalysis
- Techniques and advanced methods for the environment analysis
- Electrochemical characterization of materials
- Catalytic conversion of renewable resources (sugars and lignocellulosic biomass ) into chemical intermediates for material synthesis

### **Department of Physics (DF)**

- NANO-LAB: SCANNING PROBE MICROSCOPY AND NANO-OPTICS (nano- and micro-spectroscopy of fluorescence emission; near field optical investigations of optical active materials; surface roughness and tribology of micro-machined workpieces )
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- Dynamics of Soft Matter Lab (dynamics of thin polymer films; kinetics of polymerization; molecular dynamics at high pressure; secondary relaxations in the glassy state; stability of amorphous state; cryoprotectants fluids; bioprotection; High frequency electromagnetic properties of materials; transport in porous materials
- Laboratory “Heterogeneities and Dynamics on Different Time-Length-Scales in Soft Matter” (Glass Transition; Dynamics and Relaxation at Nanosecond and Nanometer Scales; Structural Relaxation and Aging; Mechanical Testing and Characterization of Advanced Materials, Applications of Microwave Radiation to Industrial Processing, Linear Viscoelastic Behavior of Polymers, Dosimetry, Identification, and Decay of Free Radicals Generated in Materials via ESR Spectroscopies, Microwave Techniques in Consolidation of Marble and Other Materials)



**Department of Earth Science (DST)**

- Study of calcium silicates and their thermal behaviour;
- Zeolites and zeolites-like materials;
- Structural determination on material with OD (order/disorder) nature;
- Crystallo-chemical study on rocks minerals

**Department of Biology (DB)**

Natural materials from plants and organisms  
Effects of materials on cells behaviour

**Department of Molecular, Medical and Surgical Pathology and of the Critical Area**

Materials and devices applications in the cardiovascular sector.  
Materials for surgery and controlled release

**Department of Translational Research and New Technology in Medicine and Surgery**

Materials applications in the orthopaedic sector  
Materials for surgery and controlled release

**Available research infrastructure :**

CISIM is an infrastructure that can be used by all members.  
Each of the participating departments 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 at each department can be found through the CISIM website

**Coordinate address :**

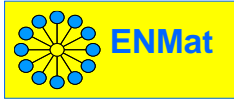
**Via Diotalvi, 2  
56126 Pisa  
Italy**

**URL**

**<http://cisim.unipi.it>**

**Contact persons :**

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**European Network of Materials Research Centres**