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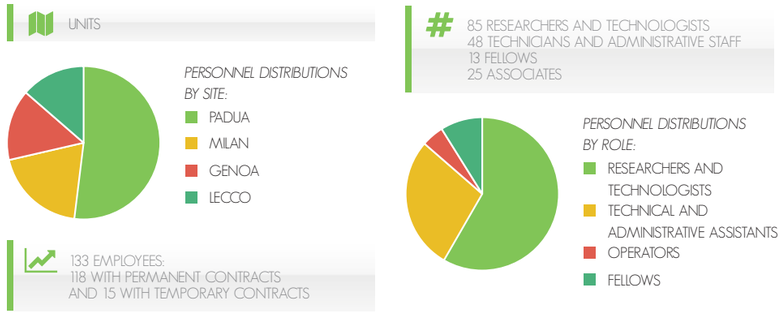
Institute of Condensed Matter Chemistry and Technologies for Energy

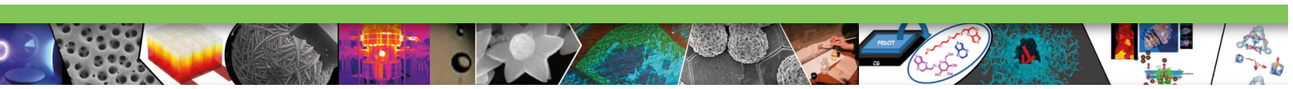
National Research Council

MISSION

The Institute of Condensed Matter Chemistry and Technologies for Energy of the National Reserach Council of Italy (ICMATE - CNR) is a highly interdisciplinary Institution, characterized by interdisciplinar expertise and consolidated know-how ranging from design and unconventional synthesis, to theoretical and experimental modeling, to prediction of relationships between structure, composition and properties of materials, interfaces and nanosystems. ICMATE has an important role in the development of innovative molecules, functional surfaces and inorganic materials, and advanced metallic components that provide relevant solutions for emerging technologies, energy efficiency and medicine, paying attention to critical issues related to raw materials and sustainability.



RESEARCH & DEVELOPMENT AND TRANSFER OF TECHNOLOGY



MATERIALS FOR ENERGETICS

Preparation and characterization of materials and thermoelectric devices and technologies; synthesis of advanced functional oxides, nanofluids for heat exchange and lubrication; development of energy devices (catalytic or not) for micro-generation; structural materials and coatings for nuclear and aerospace applications; gas turbines and energy processes, materials and technologies for renewable energies; fuel cells and hydrogen; electrochemistry of materials for catalysis; electrocatalysis, sensors and energetics; modeling and computational methods to study energy systems.

ADVANCED MANUFACTURING

Nanoparticles, nanosystems, emulsions and porous materials; super-hydrophobic systems; metallurgy, advanced metallurgical technologies and shape memory alloys; inorganic and hybrid materials.

MOLECULAR SYSTEMS AND NANOMEDICINE

Supramolecular and self-assembling systems; interfacial properties and nanoparticles; metals in medicine and radiochemistry; electroanalytical techniques for drug discovery.

COLLABORATIONS WITH COMPANIES

ICMATE has a strong collaborative tradition with international, national and local, large and small, industries and companies for the development of research innovation programmes. In particular ICMATE provides the following actions:

- Support to companies to access to public funding
- Technology transfer
- Research and development contracts with companies
- Services for companies or other parties.

UNITS

PADUA

Research in Padua deals with different areas of chemistry, materials and energetics. Examples include thermoelectric materials and devices for the recovery of waste heat, nanofluids for heat exchange, coatings for lubrification and improvement of energy efficiency of devices, protective layers, smart surfaces, materials for solid oxide fuel cells and membranes for hydrogen purification, photoactive and inorganic nanosystems as multifunctional platforms for environmental remediation, In many cases the design and development of funcional molecules and materials is supported by modelling of the functional properties and devices based on such systems.

MILAN

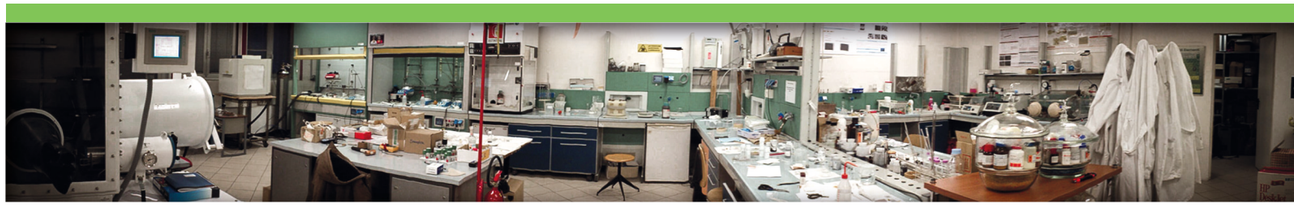
Research activity in Milan concerns the properties and technology of structural and functional materials, fluid dynamics, and diagnostics or reactive systems.
These activities are often focused on the industry requirements. Close relationships with industrial partners were indeed established in the past, through research activities, testing, and technology transfer.
Recently, a fundamental research activity in nano-materials chemistry and molecular electrochemistry has been implemented.
The areas where these activities are applied are materials for energy production, propulsion, environmental monitoring of micropollutants and nanomedicine.

LECCO

Lecco Unit was established in 1994 by an agreement between the National Research Council, the City of Lecco and Lecco Innovation Centre with the aim to promote the link between the world of research and that of small and medium enterprises. The seat is now one of the few centers in Italy able to operate in the secondary metallurgy of advanced metallic materials by applying the latest and most innovative technologies available. It exploits, in fact, expertise and apparatus for the development of semi-finished metal materials, metal sponges, thermoelectrics, shape memory alloys and functional components for applications in energy, in the transport sector in biotechnology applications or consumer-oriented. There are important apparatus for the production and transformation of pure metals and metal alloys, among which a plasma furnace and a production capacity that makes it suitable to the development of melting processes on pre-industrial scale. An additive manufacturing system (Selective Laser Melting) has also been recently acquired.

GENOA

ICMATE-Genoa has expertise in the fields of physical chemistry of interfaces and in the preparation of powders, ceramics and composites of functional oxides.
The phenomena of adsorption of surfactants at liquid interfaces, also in the presence of solid nanoparticles, are studied by dynamic surface tension measurements and by interfacial rheology, in reference to the formulation/stability of emulsions and foams and to the development and characterization of superhydrophobic surfaces as well as of nano-structured materials. These studies also see applications in the bio-medical field and in the marine environment.
The high temperature studies are directed to the assessment and modeling of thermophysical properties of liquid metals, of their interactions with solids, also in microgravity conditions, for defining their reactivity and for the design of metallurgical processes and joining.
Ceramic materials, characterized by proton-, anionic- or mixed-conduction, and metals are studied for different applications, in particular for the transformation and the accumulation of energy.



LABORATORIES

ICMATE is equipped with advanced laboratories for the unconventional synthesis of materials and nanostructures, innovative characterization and fabrication techniques, facilities for the testing of functional properties, which allow operating at various levels from fundamendal research to technological innovation.

KNOWLEDGE DISSEMINATION

The Journal of Cultural Heritage (JCH) is a multidisciplinary journal of science and technology for studying problems concerning conservation and awareness of cultural heritage in a wide framework. For more information see:

ICMATE is the editor of the Journal of Cultural Heritage.

www.icmate.cnr.it/jch