

Labex MATISSE

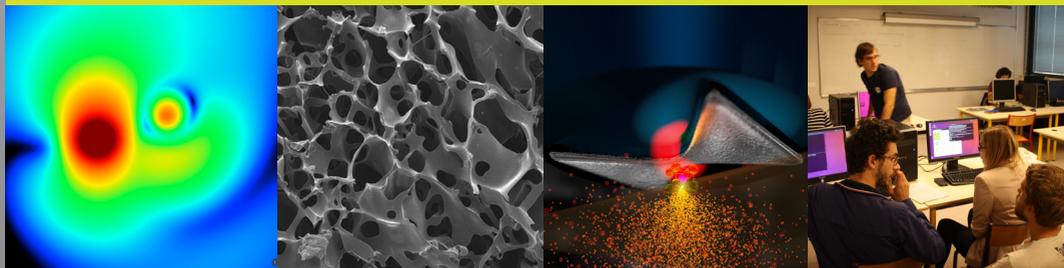
**MATerials,
InterfaceS, Surfaces,
Environment**

MATERIALS SCIENCE



An interdisciplinary field

Both science and society find themselves at a crossroads after a few decades of strong and fast development. Basic sciences are evolving into new disciplines where innovative research and cross-disciplinary skills are needed. Society is confronted with challenges which require scientists to integrate social and economic criteria as well as out-of-the-box approaches in their research. In this context the interdisciplinary field of Materials Science has a major role to play. Materials, and especially novel, innovative materials, are at the heart of huge sectors of economic activity and are often precursors to the development or transformation of these sectors.



www.matisse.upmc.fr - @LabexMatisse

LABEX MATISSE

MATerials, InterfaceS, Surfaces, Environment

At Sorbonne University, the Cluster of Excellence MATISSE is a multidisciplinary project at the frontiers of chemistry, physics and Earth sciences. It mobilizes a large research consortium around the study of both natural and synthetic materials, addressing major societal issues.

A scientific ambition: to understand the fundamental principles that govern the organization of matter in order to develop new materials with remarkable properties.

MATISSE brings a unique set of skills for the preparation of advanced materials by chemical or physical approaches, the characterization of the properties at multiple scales and even under extreme conditions, and the computer modelling of materials.

The aim of MATISSE is to build a strong materials science community at Sorbonne University, through an active research program that supports innovative collaborative projects as well as interactions with industrial partners, and an integrated graduate program around Materials Science.

RESEARCH AXIS

Six thematic axis

- 1 - Biomineralisation
- 2 - Multifunctional materials and environment
- 3 - Interfaces, transport, reactivity
- 4 - Dimensionality and confinement
- 5 - Materials in extreme conditions

One transversal axis

- T - Methodologies for materials modelling.

MATISSE COMMUNITY

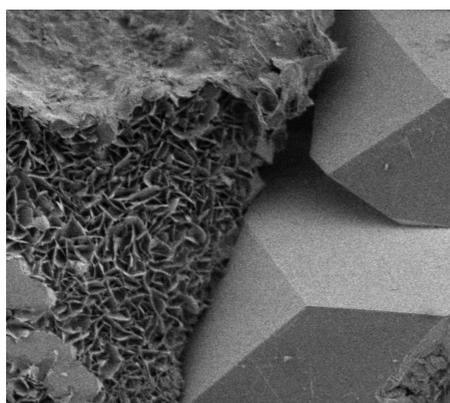
360 academic staff
130 technical staff

8 ERC grants
2 CNRS silver medals
and 5 CNRS Bronze medals
2 members of the French Academy of Science

RESEARCH

MATISSE, a highly structured scientific project

MATISSE relies on some of the most prestigious French research teams in chemistry, physics, and Earth sciences around transdisciplinary projects in materials science.



KEY FIGURES

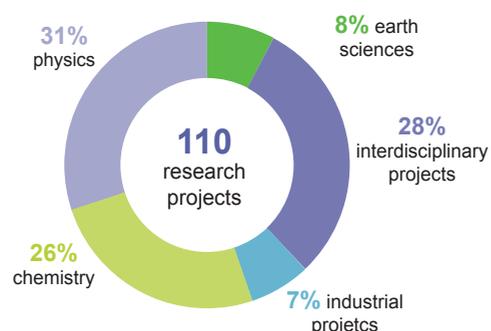
110 research projects

14 equipment projects

27 invited professors

> 200 publications

The members of MATISSE share a common ambition: to develop multidisciplinary projects, through the financial support of PhD students, post-doctoral fellows and visiting scientists.



Since its start in 2011, MATISSE launched 9 calls for proposals to support 110 collaborative research projects between two MATISSE teams, with almost 30% which were truly interdisciplinary and some with an industrial partnership. So far, these projects led to the publication more than 200 scientific articles.

MATISSE was actively involved in the co-financing of 14 projects to provide the community with advanced equipment.

MATISSE also supports the hosting of invited researchers and professors as well as the organization of scientific events.

TRAINING

Students at the heart of the MATISSE project

MATISSE is a project that deeply links research and training. MATISSE students are enrolled in master's and doctoral programs in chemistry, physics or Earth sciences and actively participate in the activities of a leading research community.

MATISSE welcomes a diverse student population through various activities and provides them with an educational environment at the highest level.

MATISSE training program is based on existing masters and doctoral schools at Sorbonne University. Since 2016, MATISSE initiated a master degree programme specialised in materials science.

In order to enhance its attractiveness, particular attention is given to international exchange programmes with the European master's programme NanoMat and educational exchange programmes with Singapour and India.

To date, MATISSE has funded 40 master's scholarships and 70 doctoral contracts in MATISSE teams, as well as 10 outgoing mobility grants for master students.

NEW SUMMER SCHOOL

PISACMS*

Since 2015, this annual international school aims to train new generations of young researchers to atomic, molecular and condensed phase computational methods.

+ <https://pisacms.sciencesconf.org>

In 2018, an exceptional edition took place in India.

* Paris International School on Advanced Computational Materials



New Master's Degree in Physics and Chemistry of Materials

In 2016, LabEx created a Master's degree course specialising in Materials Science with the aim of influencing the training of future researchers in the field.

SOME RESEARCH HIGHLIGHTS

Biom mineralisation

- Selective uptake of alkaline earth metals by cyanobacteria forming intracellular carbonates (*Environmental Science & Technology*, 2016)

Nanostructured materials

- Capillary infiltration in mesoporous films (*Nanoscale*, 2015)
- Economical solutions for large area coatings (*Advanced Materials*, 2015)
- Evaporation-driven inorganic nanostructured materials (*Chemistry of Materials*, 2014)
- Smartphone camera based sensors with MOF-based 2D photonic structures (*Advanced Functional Materials*, 2016)

2D-materials

- Intrinsic resistivity of graphene (*Nano Letters*, 2014)
- Multilayer silicene (*2D Materials*, 2017)
- Optimal light harvesting in 2D heterostructures (*2D Materials*, 2017)
- Superconductivity in space charge doped molybdenum disulphide (*Nature Communications*, 2015)

Diffusion processes

- Natural formation of gold deposits (*PNAS*, 2015)

Extreme conditions

- Hydrogen bond in 'salty' ice (*PNAS*, 2015)

Reviews

- 2D colloidal nanocrystals (*Chemical Reviews*, 2016)
- Electricity storage in supercapacitors (*Nature Energy*, 2016)
- Scattering experiments in water (*Chemical Reviews*, 2016)

MATISSE teams at Sorbonne University

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Chemistry

- Laboratoire de Chimie de la Matière Condensée de Paris (LCMCP)
- Laboratoire de Réactivité de Surface (LRS)
- Physicochimie des Electrolytes et Systèmes Interfaciaux (PHENIX)
- Laboratoire Interface et Systèmes Electrochimiques (LISE)
- Processus d'activation sélective par transfert d'énergie uni-électronique ou radiatif (PASTEUR)

Physics

- Institut des Nanosciences de Paris (INSP)
- Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC)
- Laboratoire de Physique et d'Etude des Matériaux (LPEM)
- Laboratoire de Physique Théorique de la Matière Condensée (LPTMC)

Earth Sciences

- Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC)
- Institut des Sciences de la Terre Paris (ISTeP)
- Milieux environnementaux, transferts et interactions dans les hydrosystèmes et les sols (METIS)

Cultural heritage

- Centre de Recherche sur la Conservation des Collections (CRC)



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