



Labex Matisse

ACTIVITY REPORT

MATerials, InterfaceS, Surfaces,
Environment

MATERIALS SCIENCE

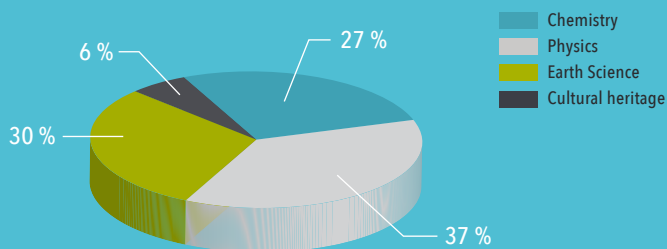
Materials are part of our daily lives and fulfill more and more functions. They have applications in fields as diverse as energy, construction, health, etc. The development of environmental protection, recycling as well as the industrial needs for lighter and more resistant materials also encourage the search for new materials.

An expert knowledge of the phenomena that are involved in the organization of matter, and of their related properties, allows scientists to develop innovative materials with improved performance. In this process, some natural materials can be extraordinary models.

How is the matter organized? Can we still imagine and create new materials with remarkable properties? Will bio-inspired materials one day supplant natural materials? How do they stand the test of time and of extreme temperatures and pressures?

The cluster of excellence Matisse takes a fresh scientific look at natural and synthetic materials, their structure and properties, combining a transverse expertise in Chemistry, Physics and Earth Sciences.

4 disciplines at the heart of Matisse



LABEX MATISSE

MATerials , Interfaces , Surfaces , Environment

The cluster of excellence Matisse, is a multidisciplinary project at the frontiers of Chemistry, Physics and Earth Sciences, which gathers a critical mass of researchers around the study of both natural and synthetic materials, to serve major socioeconomic issues.

Our scientific ambition: to understand the fundamental principles that governs the organization of matter and thus be able to develop new materials with remarkable properties.



Matisse targets with a fundamental approach a better understanding of the organization of matter and the properties the ambition is to create new materials with unique properties for given applications.

Matisse supports several large industrial groups such as Saint Gobain, Essilor, Air Liquide, SAGEM, Arcelor-Mittal, EADS, LVMH Recherche, Lafarge Ciments and three EPIC: IFP-EN, CEA and ANDRA.

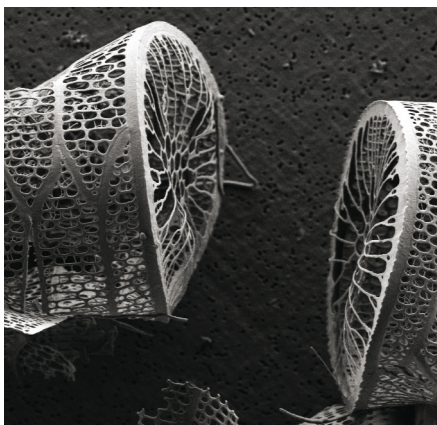
The great originality of Matisse's research program, given the diversity of the involved teams, is to study materials in their environment, for example by studying their alteration, biodegradation, but also materials for the environment in areas such as pollution control and energy. The expertises present in Matisse-chemistry, physics, life science, heritage materials-allows to approach the study of materials through several thematic axes.

18 partners, 400 researchers

RESEARCH

Matisse, a highly structuring scientific project

The cluster of excellence Matisse brings together prestigious players in chemistry, physics, life sciences and cultural heritage in Ile de France, around transdisciplinary materials science projects.



6 themes in Matisse:

- Biomineralization
- Multifunctional Materials and Environment
- Interfaces, transport and reactivity
- Dimensionality and confinement
- Materials in extreme conditions

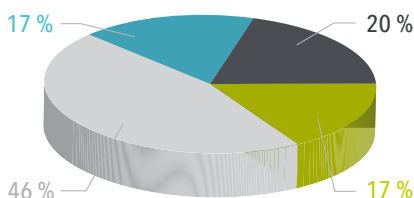
1 transversal theme:

- Methodology for materials modeling

Matisse members share a common ambition: to build together innovative and high level research and education programmes to promote Materials Science at Sorbonne Universities. For this purpose, Matisse provides significant resources to their laboratories to develop structuring and multidisciplinary projects, through the financial support of PhD students, post-doctoral fellows and visiting scientists. Thus, the Matisse ecosystem greatly benefits from the international attractiveness of these projects.

Period 2012-2015

- 25 doctoral projects
- 11 post-doctoral projects



EDUCATION

Students in the heart of Matisse project

Matisse relies on a program in which research and education are deeply connected. The master and PhD students in chemistry, physics and earth science are integrated in a very active and highly qualified research community.

Through a variety of education actions Matisse aims to address whole the student population and to provide an educational environment at the highest level.

Matisse relies for its education program on existing masters and doctoral programs, and in particular international programs to enhance its attractiveness.



Over **40** Master degree students, including **8** in the International Master Nanomat, have been supported for their internship.

Science and Technology Master at UPMC

Chemistry, material chemistry.

Physics and Applications, specialization materials science and nano-objects.

Sciences of the Universe, Environment, Ecology, specializations continental environments and hydrosiences.

Doctoral Schools

ED 397 · Physics and Chemistry of Materials

ED 398 · Geosciences and Natural Resources

ED 564 · Physics in Ile de France

ED 227 · Natural Sciences and Humanities

International Master, Nanomat

Support actions for students:

- Access to mobility grants
- Organization of thematic schools
- Financial support to attend conferences

KEY FACTS

Matisse organized and supported numerous events since its launching in 2011

- Four annual calls for proposals launched
- Three Matisse scientific annual days
- Two industrial in partnership with the SATT Lutech
- Matisse has welcomed 8 invited professors and organized seminars on these occasions

Their research expertise:

- Physics of Solids
- Nanomaterials

- Diffraction techniques
- Geochemistry
- Geomicrobiology
- Nano- cellulose

Three thematic schools:

- Preparation of catalysts
- Biomineralization
- Advanced computational materials science

Matisse also sponsors national and international conferences and supports the participation of students and researchers to certain conferences

2012

1st Conference of the AFA (French Association on adsorption)

2013

Workshop on the "Use of Transmission Electron Microscopy and its Analysis Techniques".

The 2nd international Summer school on "Energy and Environmental science"

Workshop "fabrication of nano-devices by self assembly"

2014

Workshop: JEELS, Roscoff

International Sol-Gel Society Summerschool

Condensed Matter Workshop in Paris

International workshop at Synchrotron Soleil

2015

Les Houches School "Sound and Light: phononics and photonics at the nanoscale"

Workshop Or-Nano

Summerschool of the GDR-Pulse

Institutional Partners

The cluster of excellence Matisse, supported by Sorbonne-Universités is composed of 18 laboratories that depend on 11 institutions.

Institutions

Université Pierre et Marie Curie

CNRS

Muséum National d'Histoire Naturelle Université

Paris-Sorbonne

Collège de France

ENS

ESPCI ParisTech

Chimie-ParisTech

IRD

Ministère de la Culture et de la Communication

IFP Energies Nouvelles

Matisse laboratories

Chemistry

- Laboratoire de Chimie de la Matière Condensée de Paris (LCMCP) UMR 7574
- Laboratoire de Réactivité de Surface (LRS) UMR 7197
- Physicochimie des Electrolytes et Systèmes Interfaciaux (PHENIX) UMR 8234
- Laboratoire Interface et Systèmes Electrochimiques (LISE) UMR 8235
- Processus d'activation sélective par transfert d'énergie uni-électronique ou radiatif (PASTEUR) UMR 8640
- Institut des Recherche de Chimie Paris (IRCP) UMR 8247

Physics

- Institut des Nanosciences de Paris (INSP) UMR 7588
- Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC) UMR 7590
- Laboratoire de Physique Théorique de la Matière Condensée (LPTMC) UMR 7600
- Laboratoire de Physique et d'Etude des Matériaux (LPEM) UMR 8213

Earth Science

- Institut de Minéralogie, de Physique des Matériaux et de Cosmochimie (IMPMC) UMR 7590
- Institut des Sciences de la Terre Paris (ISTeP) UMR 7193
- Milieux environnementaux, transferts et interactions dans les hydrosystèmes et les sols (METIS) UMR 7619
- Laboratoire de Géologie de l'Ecole Normale Supérieure (LG-ENS) UMR 8538
- Reactive transport and rock-fluid interfaces @ IFP Énergies nouvelles (RF@IFP-EN)

Cultural heritage

- Centre de Recherche sur la Conservation des Collections (CRC) USR 3224
- Laboratoire de Recherche des Monuments Historiques (LRMH)
- Centre de recherche et de restauration des musées de France (C2RMF)
- Centre André Chastel (CAC) UMR 8150



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