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**imdea**  
materials



## Encompassing Research of Excellence and Technology Transfer



**Unión Europea**

Fondo Europeo  
de Desarrollo Regional  
“Una manera de hacer Europa”



**Comunidad de Madrid**

[www.madrid.org](http://www.madrid.org)



- IMDEA is a network of non-profit, independent research organizations promoted by the Comunidad de Madrid to:
  - Perform research of excellence
  - Promote technology transfer to industry to improve competitiveness
  - Attract talented researchers to the region of Madrid
  
- IMDEA initiative comprises seven independent research institutes in different areas (water, food, energy, materials, nanoscience, networks and software).
  
- IMDEA Materials Institute is governed by the Board of Trustees, which includes representatives from Comunidad de Madrid (4), research institutions (UPM, UCM, UC3M, CSIC), international scientists (5) and industry (ITP, Airbus, Abengoa, Antolín)
  
- Selection of researchers is overseen by the Scientific Council composed by 15 scientists with an international reputation in MS&E

■ **≈100 researchers from 17 countries:** 16 staff researchers, 3 visiting scholars, 21 postdoctoral, 44 doctoral students, 20 master students

- 50% of the researchers are foreign nationals
- 60% of the PhD were granted by foreign universities:

**Spain:** UPM, UCM, UPC, UPV, University of Zaragoza, ...

**Europe:** Cambridge (2), Max Planck for Iron Research, Delft University of Technology, University of Leoben, Dublin City University, Università di Bologna, Institut Polytechnique de Grenoble, Katholieke Universiteit Leuven, Institute of Semiconductor Physics (Ukraine), ...

**America:** Illinois Institute of Technology, University of California Berkeley, University of Maryland, University of California San Diego, McMaster University, State University of Campinas, ...

**Asia:** University of Hyderabad, China Central South University, Sichuan University, Zhejiang University, University of Science and Technology of China, ...

# CONSTRUCTION OF IMDEA MATERIALS HEADQUARTERS

## ■ Name of the project:

- Construction of IMDEA Materials Headquarters

## ■ Budget

- Total amount: 14.000.000 €
  - FEDER Funds: 7.000.000 €
  - MINECO: 7.000.000 € (Loan)
- Construction of the building: 11.600.000 €
- Laboratory Furniture: 400.000 €
- Scientific Equipment: 2.000.000 €

## ■ Milestones

- Beginning of construction: May 21st, 2010
- End of construction: November 21st, 2011 (18 months)
- Activity and operating license: January 20th, 2012
- Move to the new building: July 22<sup>nd</sup>, 2012





# CONSTRUCTION OF IMDEA MATERIALS HEADQUARTERS

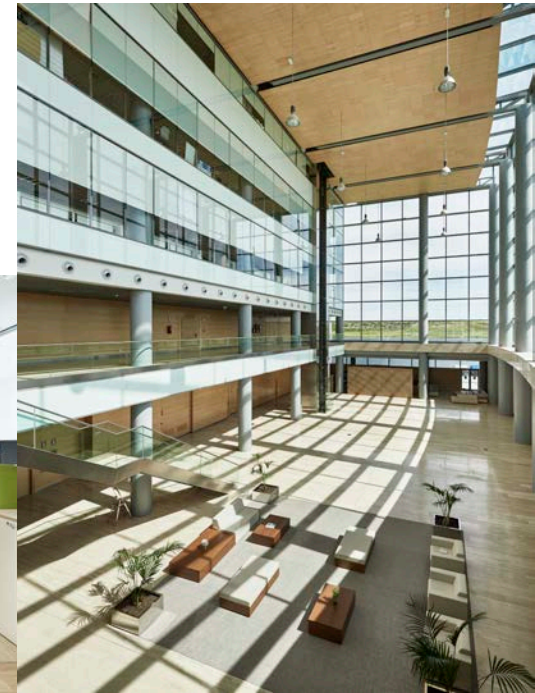
## ■ Location

- The building is located in Tecnogetafe within the Polytechnic University of Madrid area. The plot has an area of 6,444 m<sup>2</sup>.

## ■ Building

- The building has a total floor area of 18.854,41 m<sup>2</sup>. The usable space is distributed as follows:

- Research facilities: 2.460 m<sup>2</sup>
- Researchers Offices: 2.305 m<sup>2</sup>
- Shared area (atrium, meeting rooms, etc): 2.285 m<sup>2</sup>
- Underground parking: 6.620 m<sup>2</sup>
- Warehouse: 1.980 m<sup>2</sup>



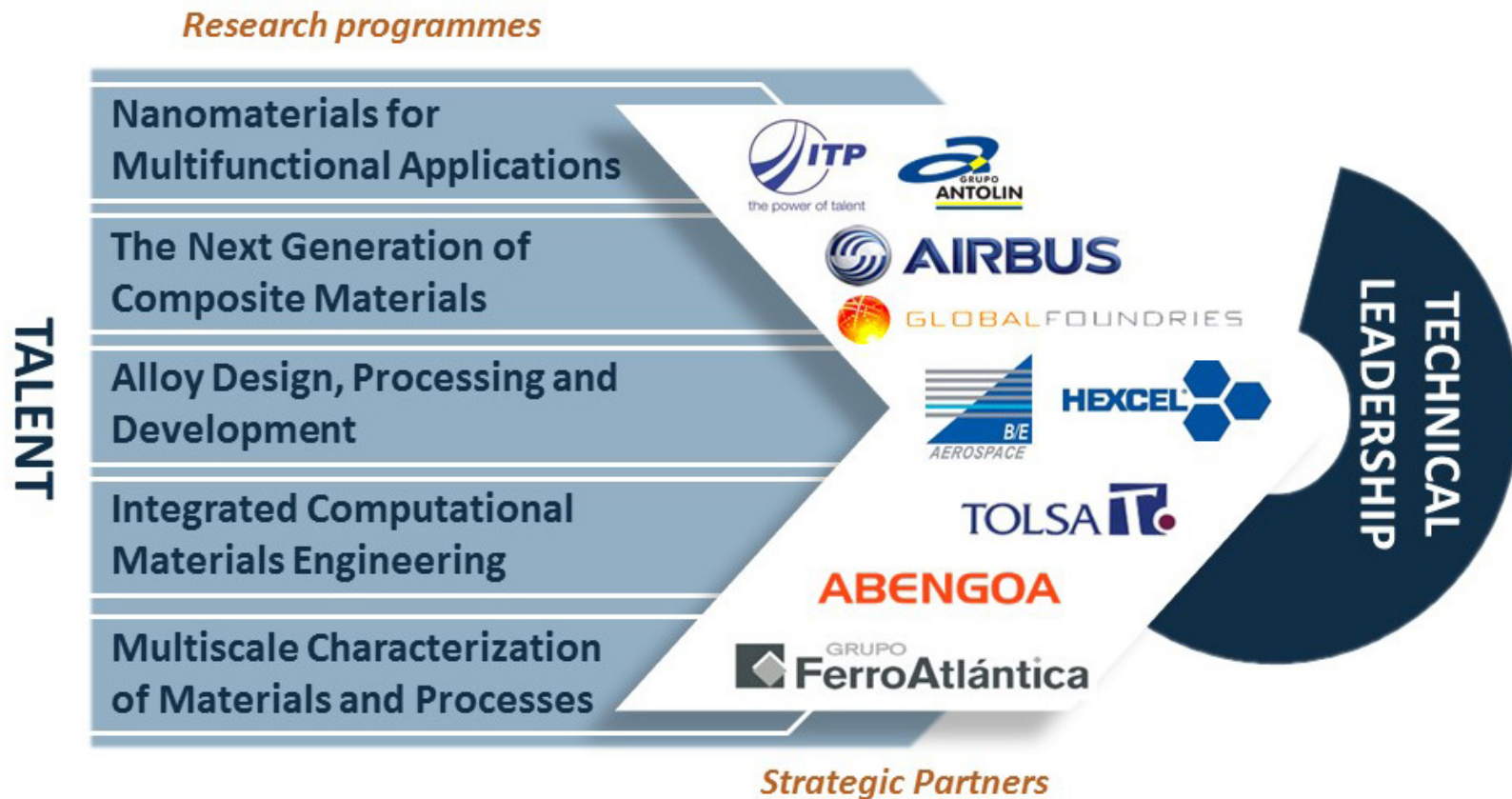
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## ■ Building is fully operative with 16 research lines and 9 laboratories:

- Chemical Synthesis Laboratory
- Fire Testing Laboratory
- Functional Properties Characterization Laboratory
- Metallography Laboratory
- Nanomaterials Processing I and II Laboratories
- Machine Workshop
- Mechanical Characterization Laboratory
- Microscopy and Nanomechanics Laboratories
- X-Ray Characterization Laboratory





- Focus combines **applied research** (encompassing the midterm interest of industrial partners) with **fundamental research** (topics at the frontiers of knowledge to provide long-term technological leadership).





## ■ Multifunctional Nanomaterials

- Carbon-based nanomaterials (graphene, nanotubes, nanofibers and hybrids) for energy generation, storage, sensors, etc.
- Polymer-based multifunctional nanocomposites (fire retardancy, sustainable bio-based, recyclability)
- Nanoscale multilayers for extreme environments.

## ■ Novel Alloy Design, Processing & Development

- Metallic alloys for high temperature applications (Ni/Co, TiAl, NiAl, etc.)
- Light alloys and their composites
- Casting, solidification & welding
- Physical simulation of metallurgical processes (welding, forging, etc.)
- High-throughput screening of materials

## ■ Next generation of Composites

- Low-cost processing of high performance composites (out-of-autoclave, hot-forming, in-situ consolidation of thermoplastics)
- New frontiers of structural performance (high temperature, impact, self-healing, non-conventional lay-up configuration)
- Composites with multifunctional capabilities (fire resistance, electrical and thermal conductivity)



## ■ Multiscale Characterization of Materials and Processes

- 3D characterization of materials, including microstructural, chemical and crystallographic analysis across several length scales (from nm to mm)
- *In situ* characterization across multiple scales (4D characterization) to study the kinetics of processes (mechanical, thermal, chemical, etc.) from the nm to mm scale.
- Cross-correlation between experiments and multiscale simulations (molecular dynamics, dislocation dynamics, crystal plasticity, computational micromechanics,..).

## ■ Integrated Computational Materials Engineering

- Virtual design, virtual processing and virtual testing.
- Multiscale materials modelling (*ab initio*, molecular mechanics, MonteCarlo, computational thermodynamics, phase-field, finite element, homogenization, etc.)
- Computational and data-driven materials discovery.

- **Carbon Nanotube Fibre Spinning Reactor**
- **CVD reactor** (graphene, 2D materials & nanotubes)
- **Processing of structural composites** (pultrusion, RTM, infiltration, hot-press)
- **Triple roller mill** (thermoset-based nanocomposites)
- **Injection molding and twin extruder** (polymer and polymer nanocomposites)
- **Directional solidification and casting**
- **Thermo-mechanical processing of metallic alloys** (Gleeble 3800)
- **Materials characterization** (XCT, XRD, Raman, DSC, DMA, TGA, etc.)
- **TEM & Dual-beam FIB & FESEM** (with STEM detector, 3D EBSD and EDS)
- **Mechanical testing** (static, fracture, fatigue, impact, DMA)
- **In situ mechanical testing** (SEM, XCT, TEM) up to 700°C
- **Fire testing** (cone calorimeter, UL94, LOI)
- **Nanoindentors** (up to 750°C)
- **High performance computer cluster** (~3Tflops, ≈400 cores)

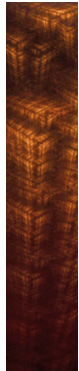
## ■ Publications, conferences and patents

- 89 articles published in SCI Journals: Acta Materialia (7), Scripta Materialia (5), Composites Science and Technology (2), Composite Structures (4), RSC Advances (4), J Materials Chemistry A (3), Metall Mater Trans (5), Nature, Scientific Reports, J Mechanics and Physics of Solids, ACS Nano, etc.
- 3 patent applications
- 32 plenary/keynote lectures at international conferences and 30 invited seminars at universities and research centers.
- Organization of 6 international workshops/conferences (>2000 participants)
- 3 PhD theses and 15 MEng/BEng theses defended
- 3 awards to the best PhD thesis (UPM, Spanish Society of Composite Materials and Association of German Steel Manufacturers, VDEh)

## ■ Current research projects: 56

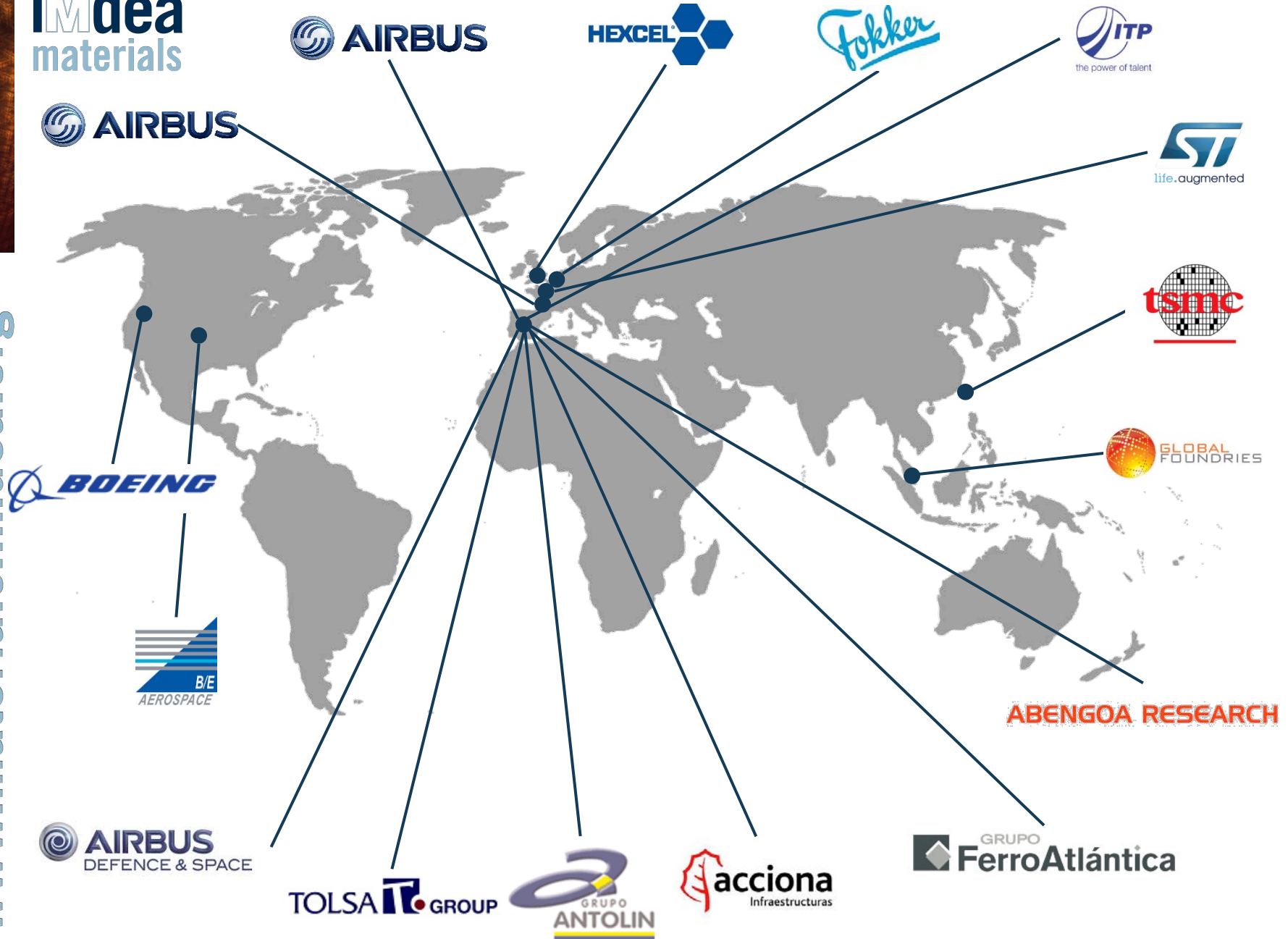
- 2 regional, 11 national, 16 european (European Research Council, 7<sup>th</sup> FP, H2020), 12 international (1 Brasil, 11 China Scholarship Council) and 15 industrial

# INDUSTRIAL PARTNERS



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