nano newsletter

nano tech 2008 - Special Issue

February 2008

http://www.phantomsnet.net

Spanish Pavilion

PHANTOMS foundation

Nanoscience & Nanotechnology Platform

TNT2008 Trends in NanoTechnology Oviedo (Spain) September 01-05, 2008

nanobio europe Barcelona 2008

M4nano Modelling for Nanotechnology Initiative

NanoSpain Spanish Nanotechnology Network Red Española de Nanotecnología

NaPa Emerging Nanopatterning Methods

Pico-Inside

nanoICT coordination action

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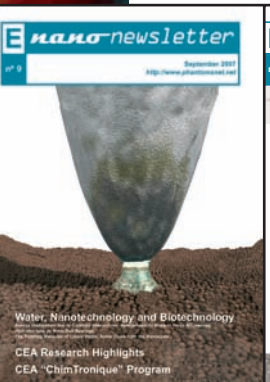

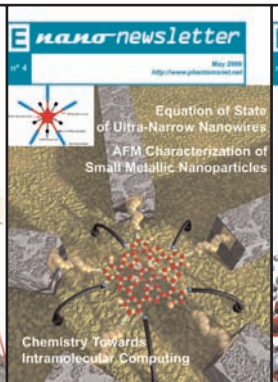

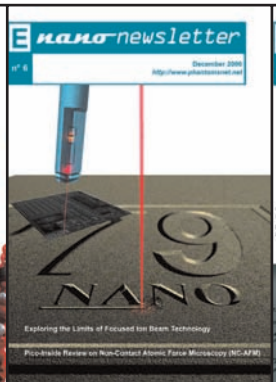

E nano newsletter

Editorial Information

Spanish Pavilion at nanotech 2008 – World's Largest Nanotechnology Exhibition

The Phantoms Foundation and The Spanish Institute for Foreign Trade (ICEX) have promoted the first Spanish Pavilion at nanotech2008 (Japan), as an initiative under the program **España, Technology for Life.**

This program, carried out by ICEX, focuses in the promotion in foreign markets of Spain's more Innovative and leading industrial technologies and products.

The Spanish participation will group 12 Companies and Research Centres providing an outlook of the most innovative projects and products in various fields of Nanoscience & Nanotechnology.

The Spanish Pavilion will therefore promote the "Spanish Nanoscience and Technological Offer", allowing to:

1.Represent the Scientific, Technological and Innovative agents of the country as a whole.
2.Foster relationships with other nanotech2008 participants.
3.Promote country culture of innovation.
4.Better integrate the Spanish "Science-Technology-Company-Society" system in Europe and Far East.
5.Generate and develop scientific and technological knowledge
6.Improve competitiveness and contribute to the economic and social development of Spain.

The **Spanish Institute for Foreign Trade (ICEX)** ("Instituto Español de Comercio Exterior") is the Spanish Government agency serving Spanish companies to promote their exports and facilitate their international expansion.

It is part of the Spanish Ministry of Industry, Tourism and Trade ("Ministerio de Industria, Turismo y Comercio").

To meet its objectives, ICEX is assisted by the network of Spanish Embassy's Economic and Commercial Offices and, within Spain, by the Regional and Territorial Offices.

The Institute acts in the following areas:

(1) It designs and carries out commercial promotion and investment programs in foreign markets;

(2) It prepares and provides information regarding international markets and the Spanish products offered;

(3) It promotes the teaching of technical skills to business people and the training of professionals in foreign trade. See: "Master in International Corporate Management"

The **Phantoms Foundation** (Madrid, Spain) focuses its activities on Nanoscience, Nanotechnology and Emerging Nanoelectronics and is now a key actor in structuring and fostering European Excellence and enhancing collaborations in these fields. This non-profit Association is also playing an important role as a dissemination platform in national and 6th-7th framework programs European funded projects to spread excellence among a wider audience and help in forming new networks.

In particular, the Phantoms Foundation agglutinates and coordinates the efforts made in the field of Nanoscience and Nanotechnology by Spanish groups from universities, research institutes and companies through several initiatives such as scientific events, networking and participation to International Exhibition events such as nanotech2008.

Spanish Pavilion: participating companies/institutions

- Phantoms Foundation (coordinator)
- CIC nanoGUNE
- CIC microGUNE
- CIC biomaGUNE
- IMDEA nanoscience
- CIBER BBN
- Nanotec Electronica S.L.
- Endor Nanotechnologies S.L.
- Nanotex (Solutex Group)
- Grupo Antolin S.A
- Nanogap S.A.
- Acciona S.A

International Nanotechnology Exhibition & Conference nano tech 2008

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E nano newsletter Editor
Phantoms Foundation

SPANISH INSTITUTE FOR FOREIGN TRADE ICEX

españa, technology for life.

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Nanoscience & Nanotechnology Platform

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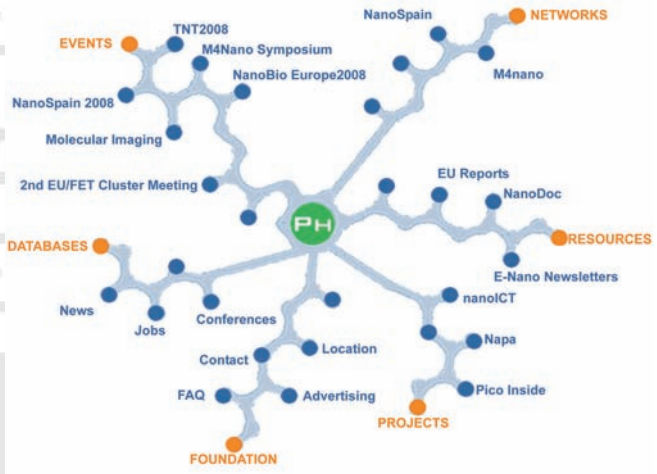
Foundation purpose & Activities

The Phantoms Foundation (non-profit organisation) was established on November 26, 2002 (in Madrid, Spain) in order to provide high level management profile to National and European scientific projects such as NAPA (Emerging Nanopatterning Methods-NMP/FP6 Integrated Project), Pico-Inside (Computing Inside a Single Molecule-IST/FP6 Integrated Project) or NanoSpain (Spanish Nanotechnology Network).

The Phantoms Foundation is also working in close collaboration with Spanish and European Governmental Institutions such as MEC (Spanish Ministry of Science), ICEX (Spanish Institute for Foreign Trade) or the European Commission to provide focused reports on Nanoscience & Nanotechnology related research areas (infrastructure needs, emerging research, etc.) and develop activities to stimulate commercial nanotechnology applications (Spanish Pavilion at nanotech2008).The Phantoms Foundation focuses its activities on Nanoscience, Nanotechnology and Emerging Nanoelectronics and is now a key actor in structuring and fostering European Excellence and enhancing collaborations in these fields. This non-profit Association is also playing an important role as a dissemination platform in national and 6th-7th framework programs European funded projects to spread excellence among a wider audience and help in forming new networks.



Current projects and activities:

- Coordinator of the nanoICT Coordination Action (FP7-ICT/FET): Nanoscale ICT Devices and Systems
- Coordinator of the dissemination activities within the Integrated Project NaPa (FP6-NMP): Emerging Nanopatterning Methods
- Coordinator of the dissemination activities within the Integrated Project Pico-Inside (FP6-IST/FET): Computing Inside a Single Molecule
- Coordinator of the Spanish Nanotechnology Network "NanoSpain" (233 groups)
- Coordinator of the Modelling for Nanotechnology "M4nano" Initiative
- Organisation of high-level scientific conferences/workshops on Nanoscience & Nanotechnology: "Trends in Nanotechnology" International Conference (TNT2007 / TNT2008), NanoSpain2008, Nanobio-Europe2008 and events co-organised with the European Commission (SMS2007 / 2nd EU/FET Cluster Meeting).
- Publication of a printed Newsletter on Nanotechnology (E-Nano) aiming at promoting European Nanotechnology results and enhancing collaborations between groups.
- Publication of focused reports on specific areas of interest for the Nanoscience/Nanotechnology Community (prepared in collaboration with the European Commission or Spanish Governmental Institutions). These reports provide focus and accelerate progress in identified R&D directions for the EC programs, guide public research institutions keeping Europe at the forefront in research and also provide a valid source of guidance for governmental institutions.
- Development of a multidisciplinary WEB site providing information on Nanotechnology and Nanoelectronics in particular (Emerging Nanoelectronics). Such initiative allows to strengthen excellence, allow research for the advancement of knowledge and its industrial application; and increase the impact of Nanotechnology worldwide.

nanoICT Coordination Action – project summary (FP7-ICT/FET)

Short Facts	
nanoICT	Nanoscale ICT Devices and Systems – Coordination Action
EC contribution	1 Meuros
Contract number	216165
Nº of partners	12
Coordinator	Phantoms Foundation (Spain) / Antonio Correia
Start date	January 01, 2008
Duration	36 months

The NanoICT Coordination Action activities will reinforce and support the whole European Research Community in "ICT nanoscale devices" covering the following research areas expected to demonstrate unconventional solutions beyond the expected limits of CMOS technology:

1.Demonstration of new concepts for switches or memory cells

2.Demonstration of new concepts, technologies and architectures for local and chip level interconnects with substantial improvements over current solutions

3.Demonstration of radically new functionalities by the integration of blocks from a few nanometres down to the atomic scale into high added-value systems
The CA action plans will go beyond the organisation of conferences, workshops, exchange of personnel, WEB site, etc. developing the following activities:
1.Consolidation and visibility of the research community in ICT nanoscale devices
2.Mapping and benchmarking of research at European level, and its comparison with other continents
3.Identification of drivers and measures to assess research in ICT nanoscale devices, and to assess the potential of results to be taken up in industrial research
4.Coordination of research agendas and development of research roadmaps
5.Coordination of national or regional research programmes or activities, with the aim to involve funding authorities in building the ERA around this topic
6.Development of strategies for international cooperation on themes related to NanoICT.
Expected impact will be the enhanced visibility, shaping and consolidation of the NanoICT research community in Europe.

PicoInside Integrated Project – project summary (FP6-IST/FET)

Short Facts	
Pico-Inside	Computing Inside a single molecule using atomic scale technologies
EC contribution	5,1 Meuros
Contract number	014857
Nº of partners	15
Coordinator	CEMES-CNRS (France) / Christian Joachim
Start date	September 01, 2005
Duration	42 months
Universities	7
Research Institutes	5
Associations	1
Companies	2

Creating an Atomic Scale Technology is now a necessity for any uni-molecular device and machine in molecular electronics, molecular mechanics, molecular transducers and for laboratory scale experiments on one molecule. In the IST priority 2 of the FP6 (Emerging Nanoelectronics FET proactive initiative), the Pico-Inside consortium will explore Atomic Scale Technology with the final goal of integrating a complex logic gate inside a single molecule.

For reference, Atomic Scale Technology recently arose from the very precision (better than 0.05 nm) required to interconnect a molecule and from the demonstration of a conformation change inside a single molecule with a precision better than 0.1 nm. Atomic scale technology is a bottom-bottom approach using the bottom-up one of nanotechnology to solve the nano to mesoscale nano-communication problem.
In Pico-Inside, you can meet 15 of the most talented academic and industrial research institutes in Europe working together on (1) new intramolecular architectures for integrating a complex digital logic function inside a single molecule, (2) understanding the electronic and mechanical behaviour of a single molecule on a surface with the best LT-UHV-STM and UHV-NC-AFM instruments in Europe, (3) the 4 stages of the interconnection problem from the atomic to the macroscopic scale: 50 pm to 5 nm (atomic wires), 5 nm to 50 nm (mesa island), 50 nm to 5 µm (nanostencil), 5 µm to 1 mm (micro-cantilever array), (4) organic chemistry for synthesising the supermolecule holding the intramolecular logic gate board and all the lateral chemical group equipping the final molecule to perform on a surface, (5) theory of large molecule surface science including molecular structure extraction for the experimental STM and NC-AFM images.
To prepare the future FPX (Framework Programme) of European Research with X = 7 and 8, Pico-Inside will provide a full range of roadmapping for interconnect and nanocommunication, for chemistry of supermolecules and for intramolecular computing.

NanoSpain – Spanish Nanotechnology Network

In order to ensure that Spanish industry and R&D facilities play a key role in Nanoscience and Nanotechnology, the NanoSpain Network scheme aims to promote Spanish science and research through a multinational networking action and to stimulate commercial Nanotechnology applications.
This initiative allows the exchange of ideas, provide information either from universities or from companies, and therefore act as a catalyst for Spanish research and industry.
The Network (partially funded by the Spanish Ministry of Science) is of a truly interdisciplinary character and currently involves 233 partners.

E-Nano Newsletter

This journal (published by the Phantoms Foundation) provides three-monthly scientific articles, reports and general information in the field of Nanoscience & Nanotechnology and more specifically "Emerging Nanoelectronics". This newsletter also publishes relevant information about Integrated Projects funded by the European Commission such as NaPa and Pico-Inside. First issue was published beginning of June 2005.

9th Trends in Nanotechnology International Conference (TNT2008)

Oviedo (Spain): September 01-05, 2008

This high-level scientific meeting series aims to present a broad range of current research in Nanoscience and Nanotechnology as well as related policies (European Commission, NNI, etc.) or other kind of initiatives (iNANO, IEEE, GDR-E, FinNano, etc.). TNT events have demonstrated that they are particularly effective in transmitting information and establishing contacts among workers in this field. Graduate students fortunate to attend such events quickly learn the importance of interdisciplinary skills, thereby becoming more effective in their future research.

During the TNT2007 edition, the conference attracted around 420 scientists worldwide and featured ~70 talks, ranging from 15 minutes to 30 minutes. Approximately 266 posters were presented in two sessions. 24 companies/institutions also exhibited the latest advances in instrumentation, bibliography, etc.

TNT2008 is been launched following the overwhelming success of earlier Nanotechnology Conferences and this edition will be organised in Oviedo (Spain).

The TNT2008 structure will keep the fundamental features of the previous editions, providing a unique opportunity for broad interaction. TNT2008 will be organised by several Public and Private Organisations closely related with Nanotechnology research, manufacturing or Coordination through European and National networking. The scientific program will cover a wide spectrum of Nanotechnology research and related areas including keynote lectures, oral presentations, posters and a product/instrument exhibition.

Key topics will include, for example:

1.Carbon nanotubes based nanoelectronics and field emission
2.Nanostructured and nanoparticle based materials
3.Low dimensional materials (nanowires, clusters, quantum dots, etc.)
4.Nanofabrication tools & nanoscale integration
5.NanoChemistry
6.Nanobiotechnologies
7.Theory and modelling at the nanoscale
8.Nanomagnetism and Spintronics
9.NanoOptics & NanoPhotonics
10.SPM

Useful links

Phantoms Foundation: **http://www.phantomsnet.net**
PicoInside IP: **http://www.picoinside.org**
NaPa IP: **http://www.napaip.org**
nanoICT CA:
http://www.phantomsnet.net/nanoICT/index.php
NanoSpain Network: **http://www.nanospain.org**
M4nano Initiative: **http://www.m4nano.com**
TNT2008: **http://www.tntconf.org**
Nanobio-Europe2008:
http://www.nanobio-europe2008.com

CIC nanoGUNE
nanoscience cooperative research center

CIC nanoGUNE
The big challenge of the small

It is today accepted that nanoscience and nanotechnology can serve as an enabling platform and disruptive paradigm to develop breakthrough solutions for major technological challenges.

Nanotechnology is expected to play a critical role as an enabling technology for both traditional industry sectors and emerging high-growth sectors.

Therefore, nanotechnology has an immense potential to generate economic growth, because of its profound expected impact on a wide spectrum of industries. Along these lines, the Department of Industry, Commerce and Tourism of the Basque Government, Basque Country (Spain), is now launching the so-called "nanoBASQUE2015" Strategy, an initiative aimed at promoting nanotechnology as an enabling tool that should increase the competitiveness of the Basque industry. The nanoBASQUE2015 Strategy will provide a sustained funding over the next years with the aim of making the Basque Country an international benchmark in the research and business development of nanoscience and nanotechnology. The creation of the Nanoscience Cooperative Research Center, CIC nanoGUNE, is a key initiative within the nanoBASQUE2015 Strategy. The CIC nanoGUNE is a new research center, with legal personality, created in 2006 with the mission of addressing world-class nanoscience research for the competitive growth of the Basque Country. NanoGUNE will develop the Cooperative Research Center (CIC) concept which has

CIC nanoGUNE

nanoscience cooperative research center

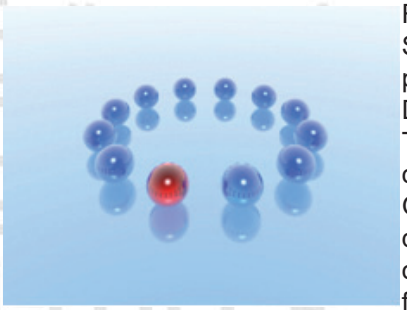
The Nanoscience Cooperative Research Center, CIC nanoGUNE, located in San Sebastian (Spain), is a new research center designed with the aims of launching new research areas in nanoscience in the Basque Country and creating an effective framework for collaboration that strengthens interdisciplinary research, promotes technology transfer and increases the competitiveness of the Basque Country.

Positions available now!!

Nano-scale devices group leader
Nano-scale imaging group leader
Clean room manager
Equipment engineer

Detailed information in **www.nanogune.eu**

been successfully implemented in various cases in the Basque Country. CIC accounts for "Centro de Investigación Cooperativa", which means Cooperative



Research Center in Spanish. The CICs are promoted by the Department of Industry, Trade and Tourism of the Basque Government and are designed with the aim of creating an effective framework of collaboration that strengthens interdisciplinary basic and applied world-class research in order to provide technology transfer and promote competitiveness of the Basque industry in strategic areas. Besides, nanoGUNE has been awarded as the first Consolider center by the Spanish Education and Science Council. Consolider centers are created under the Consolider-Ingenio 2010 Program which funds the highest ranked Spanish research consortia with world-class research lines at the forefront of Science and Technology.

The main objectives of nanoGUNE are the following:

- To lead, support and coordinate research and development in nanoscience and nanotechnology in the Basque Country.
- To promote technology transfer and the development of a nanotechnology-based industry.
- To support new academia curricula and high-level training of researchers in nanoscience and nanotechnology.
- To foster networking and the creation of alliances with entities and regions all over the world.
- To strengthen the social use of research and the public understanding of science, including science and society issues.

Structure

As well as other cooperative research centers in the Basque Country, nanoGUNE is composed of a newly created physical section, the core of the center, and what is called the virtual section. While the newly created physical section is oriented to open new areas of strategic research, in the virtual section cooperation will be fostered among existing research groups at universities, technological centers, and other institutions in the Basque Country.

Research

NanoGUNE focuses its research activities on the following four major strategic areas:

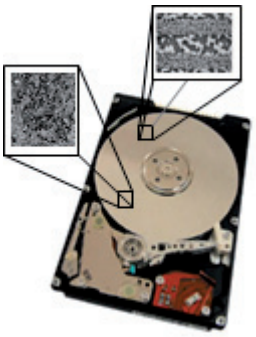
- Physics of low-dimensional structures, nanostructures and nanoscale structured complex systems.
- Synthesis, assembling, and nanofabrication of nanomaterials (nanoparticles, nanotubes, thin films, nanocomposites) and nanostructured materials.
- Development of nanodevices and its impact on molecular electronics, spintronics, nanomagnetism, and nanophotonics.
- Biofunctional nanoparticles and nanobiotechnology.

The research activity of nanoGUNE will be implemented through 7 research groups as follows:

- Nanomagnetism and nanoelectronics.
- Nanophotonics.
- Synthesis and functionalization of nanostructures.
- Nanobiotechnology.
- Nanodevices.
- Nanoscale imaging.
- Theory and simulation of nanosystems and complex materials.

The initial research program of nanoGUNE will comprise (but not be limited to) the following fields for the next three years.

Nanoelectronic properties and devices



The specific focus of this field will be on design, fabrication and characterization of nanoelectronic, nanomagnetic as well as spintronic structures and devices. Simultaneous fundamental studies of materials structures and properties with regard to electronic and magnetic properties will be pursued to outfit the more device oriented activities with the core fundamental knowledge needed for achieving breakthrough progress.

In particular, this field will include the following themes:

-Magnetization reversal, dynamics and related characterization methods, which will cover topics such as partially correlated magnetization reversal, the ΔH-method refinement for general recording media application, single shot dynamics of magnetization reversal events, and fast magnetization dynamics near magnetic ordering temperatures.

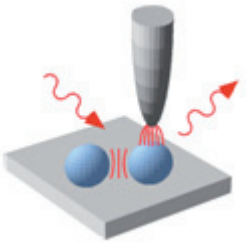
-Fabrication and magnetic properties of multilayered magnetic materials, which will include topics such as the development and exploration of strategies for reducing the grain size in functional materials, fabrication and characterization of meta-magnetic films and meta-magnet based superstructures, and investigation of all-ferromagnetic exchange bias systems with perpendicular anisotropy.

-Fabrication and characterization of magnetic nanostructures, which will address topics such as the study of the nano-scale correlation in magnetic patterned structures by magneto-optic diffraction and scattering, the manipulation and control of domain-wall structures, and the investigation of novel physical processes due to the interplay between spin currents and magnetization dynamics at the nanoscale.

Nanophotonics

The activity in this field will span the entire bandwidth from near-field investigations of light-matter interaction in confined structures and microscopy-type usage up to the

development of photonic materials for optoelectronic components in several technological fields such as telecommunications, computation, optical nanoscopy, spectroscopy and bio-sensing. In particular, the research topics under this particular field are:



-The design, fabrication and characterization of structures with tailored optical properties such as confined structures and quantum dots, photonic crystals and metamaterials that can be used in several applications such as optoelectronic and magneto-optic devices, light emitting diodes, solar cells, displays, nanoantennas, superlenses, biomarkers, sensors etc. Special attention will be paid to the development of organic materials that can lead to flexible photonic device technology.
-Development and improvement of advanced near-field optical microscopy tools and technologies for examining materials at the nanoscale.
-Understanding the underlying properties and phenomena regarding the manipulation and control of light flow and confinement as well as light-matter interaction through sub-wavelength and photonic structures.

Synthesis, functionalization and processing of nanomaterials

This field will target research on efficient synthesis methods of nanomaterials, their functionalization and processing for the purpose of allowing the fabrication of large-area functional nanoscale materials. This will encompass all aspects from the chemistry and materials science of such materials, their processing, properties, and their suitability for large-scale production. The main topics under this particular field are:
-The design and development of production routes to achieve nanomaterials with predictable and controllable properties over multiple scales. This will include the synthesis and functionalization of nanostructures of any composition, size and shape (nanotubes, nanoparticles, thin-films, etc.) and functionality; the self-assembly and self-organization of complex structures, hierarchical structures, and multi-component structures; and, finally, the processing of nanomaterials such as nanocomposites with enhanced functionality.
-Understanding the underlying processes and phenomena, including composition/physico-chemical structure/properties relationships, and self-assembly, that can lead to novel materials and enhanced functionality.

A unique infrastructure

Progress in nanoscience research is only possible if one can actually fabricate nanoscale materials and measure their properties on the nanometer scale and with sufficiently high sensitivity. Thus, one key challenge is to build a unique infrastructure, free of electromagnetic interference (EMI), with an ultra-low level of vibration and acoustical noise, and ultra-clean rooms available. In order to achieve this goal and host state-of-the-art facilities for nanoscience research, a complex working team has been put together, including vibration, EMI, and clean-room consultants. The nanoGUNE building, located at the Campus of the University of the Basque Country (UPV/EHU) in San Sebastian, is expected to be finished towards the end of the summer 2008.

Partners and funding

CIC nanoGUNE was legally constituted as a private non-profit association in 2006. The partners of nanoGUNE are:

- Donostia International Physics Center (DIPC).
- TECNALIA Technology Corporation.
- IK4 Research Alliance.
- University of the Basque Country (UPV-EHU).
- Regional Council of Gipuzkoa.

NanoGUNE acknowledges funding provided by the following institutions:

- Department of Industry, Trade and Tourism of the Basque Government and the Regional Council of Gipuzkoa through the ETORTEK Program.
- The Department of Education, Research and Universities of the Basque Government through the Basque Foundation for Science IKERBASQUE.
- The Spanish Ministry of Science and Education through the Consolider-Ingenio 2010 Program.
- The European Commission through the PEOPLE Program within the Seventh Framework Programme.

For further information, please visit our web page:
www.nanogune.eu

CIC microGUNE
Microtechnologies Cooperative Research Center

Presentation of the Centre

The CIC microGUNE Cooperative Research Centre was established to carry out research of excellence in the field of micro- and nano-technologies. It uses what are known in the scientific community as top-down strategies and methods, i.e. it seeks to reduce size as far as processing technologies permit. In layman's terms, the research performed by CIC microGUNE represents a journey into the world of the tiny, with some investigations taking place in the 100 nm range.
CIC microGUNE is the result of a Strategic Alliance between the research centres CEIT, IKERLAN and TEKNIKER, the universities MONDRAGÓN UNIBERTSITATEA AND TECNUN, and the MCC business group, with the collaboration of IMEC (Interuniversity MicroElectronics Centre (Belgium)), for technological research and deve-

lopment in micro/nano technologies.
The purpose of the centre is:

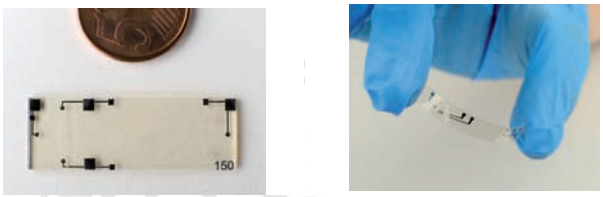
- Encourage co-operation between technological and university centres.
- Attaining a critical mass that will allow for conducting top level research in micro/nanotechnologies.
- Furthering and disseminating microsystems technology in industry in the fields of mechanical microsensors, microfluidics/microanalysis and microoptics.
- Incorporating components developed through nanotechnology in order to reinforce microsystem capabilities.
- Promoting international cooperation by acting as a regional reference network.

There are three units geographically distributed:

- Microsensors Unit.
- Microfluidics Unit.
- Micro and nanoengineering Unit.

located in the head offices of CEIT, IKERLAN and TEKNIKER, respectively, with the official head office located in the Technology Park of San Sebastian (Spain). Research lies at the core of the activities of microGUNE and it is conducted in line with the objectives laid down in the strategic research programme of the Basque Country, those of the nanoBASK 2015 strategy, and the objectives of national and European research programmes, so some of the actions taken are supported by those programmes. The R&D activities listed below seek to meet the challenges posed by the three units defined as key for microGUNE:

- Integrated Opto-mechanical Micro-components.
- Encapsulation, assembly & interconnections.
- Sensorisation of physical & chemical variables.
- Micro-structuring of silicon, polymers & metals.
- Micro-components for energy generation & communication.
- Micro-tools for biological applications.

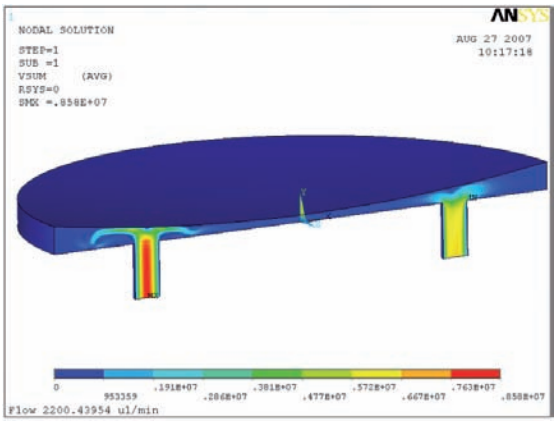


Polymer Technologies for Live Science Applications (Electrophoresis of DNA)

Summary of the Annual Report

CIC microGUNE currently has a workforce of 52. Its research is centred on the fields of micro-sensors, microfluidics and micro-optics, micro- and nano-engineering, micro-tools for diagnosis and clinical intervention and DNA microarrays for molecular diagnosis. This research takes the form of numerous domestic and international projects covering a range of future applications, though the field of health is a focus of particular interest and much of our research is oriented towards this field.

In 2006, CIC microGUNE had a turnover of close to 4 million euros, including more than 2 million euros of funding from the Basque Government Department of Industry, Trade and Tourism and the Provincial Council of Gipuzkoa. The remaining funding was obtained via European projects under the Framework Programme, under various projects in the Spanish National R&D Plan and from companies. In all, projects for companies and European projects accounted for 31% the total funding for the year. This figure clearly shows the steady consolidation of CIC microGUNE in the development of new products and applications thanks to the results of its research in the various fields of micro- and nanotechnologies.



Another salient point of the year 2006 is the effort put into disseminating technology through attendance at numerous scientific forums, more than 15 articles in journals and more than 20 publications at congresses. This represents a continuation of the efforts made in previous years, and is evidence that we are succeeding in our aim to achieve an excellent profile for the activities of CIC microGUNE in scientific forums concerned with micro- and nano-technologies. This aspect is reinforced still further by the cooperation that is gradually being cemented with other institutions at home and abroad which have expertise in the field of micro-technologies. Particular emphasis was placed on relations with IMEC (Belgium), MIC (Denmark), the Paul Sherrer Institute (Switzerland), the University of Berkeley (USA) and CNM-CSIC (Spain), which enabled us to make rapid progress in such areas as replication processes, processes and applications for nanolithography, micro-actuators for fluidic control, bioengineering, etc.

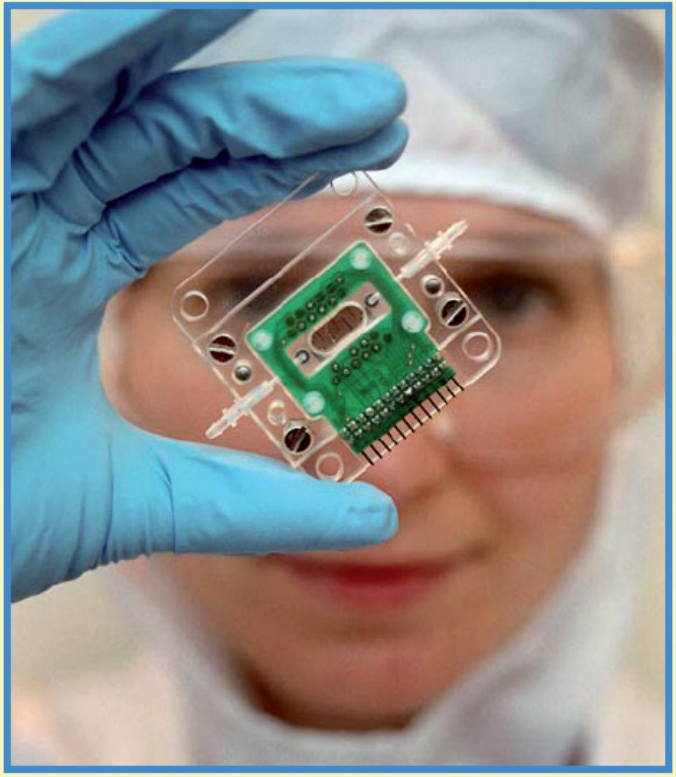
Networks & Associations

CIC microGUNE co-operates with the leading national and international networks and associations:

- EUSPEN, European Society for Precision Engineering and Nanotechnology.
- 4M, Multi Material MicroManufacture, an excellence network under the 6th Framework programme.
- EURIMUS, EUREKA programme aiming to provide support for European industry in R&D projects with European co-operation.
- MINAM, Micro/Nanomanufacturing group under the European MANUFUTURE programme.
- GENESIS, Spanish node linking with the European technology programmes EPoSS & ENIAC promoted by the 7th Framework Programme.
- PHOTONICS21, European photonics platform, promoted by the 7th Framework Programme.
- MNE 2006, International Conference on Micro and

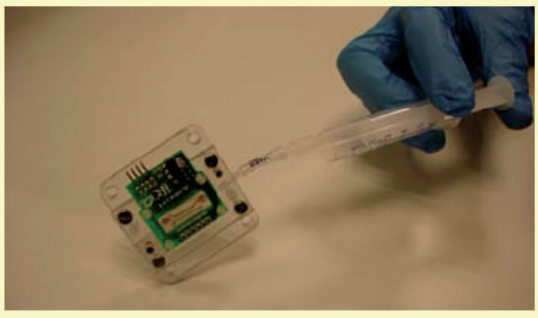
CIC microGUNE

Microtechnologies Cooperative Research Center

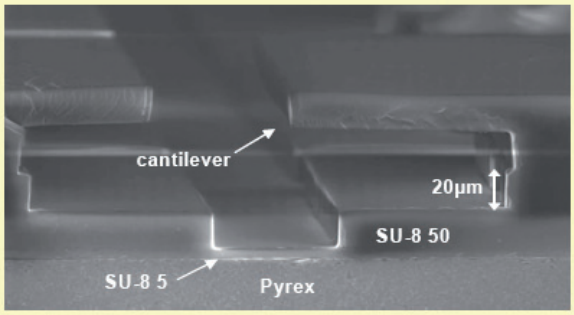


Development of

- Microsensors
- Microcomponents for power generation and communications
- Microtools for diagnostics and clinical intervention
- Microsystems for health monitoring
- Microarrays molecular diagnostics
- Optical/Fluidic microsystems
- Micro/nanoengineering



Lab on a Chip integration:
A trip from the tube to the microchip



Multilayer microfluidic structures
Flow control
Electrophoresis of DNA
Microfluidic probes

More information in www.cicmicrogune.es

Nano Engineering 2006.

- NANOSPAIN & IBERNAM, Spanish nanotechnology & micro-system networks.
- BIOSENSORES network, grouping agents for the detection of biological species.
- Assessment of projects of the national programmes of the Ministry of Education and Science.

International Co-operation (Sixth and Seventh European Framework Programmes)

CIC microGUNE seeks the collaboration with institutions with expertise in different microtechnology fields in order to attain a critical research mass that will allow for conducting top level research through the participation in joint projects, the writing doctoral theses, our researchers spending time in said institutions or their researchers spending time in the laboratories of CIC microGUNE. An example of these is the following list that shows some of the European projects in which members of CIC microGUNE are participating with consortia consisting of very important European Research Centres and Universities in the field of micro/nanotechnologies:

- Food safety and quality monitoring with Microsystems (GOODFOOD)
- Nanopatterning emerging methods (NAPA)
- Multi Material Micro Manufacture: Technologies and Applications (4M)
- (SMART HEALTH) (Integrated Biodiagnostic Systems for Healthcare)
- Integration of polymeric materials for bioclinical analyses by optical means (OPTOLABCARD)
- Intelligent Self-Adjusted Boiler for an Environment-friendly Life (ISABEL)
- Universal and Flexible Coordinate Metrology for Micro and Nano Components" (Nano CMM)
- DEvelopment of LIthography Technology for Nanoscale Structuring of Materials Using LAser Beam Interference (DELILA)
- Synergetic Process Integration of Efficient Micro & Nano Manufacture (MicroSapient)
- Universal and Flexible Coordinate Metrology for Micro and Nano Components" (Nano CMM)
- Portable automated test for fast detection and surveillance of influenza (POTFASTFLU)
- Laboratory Skin Patches and SmartCards based on foils and compatible with a smartphone

Currently CIC microGUNE carries out a special collaboration with MIC (Denmark) and Paul Scherrer Institute (PSI) in Switzerland, to research in the domain of micro-fluidics and nanolithography. More exactly, with MIC we are collaborating on the design and development of diffe-rent concepts of microactuators for fluidic control based on polimeric materials and loose structures oriented to devices with a biological application. With Paul Scherrer Institute (PSI) on the development of processes and applications of the Lithography of Nanoprinting.

Publications

Some of the recent publications are:

• F. J. Blanco, M Agirregabiria, J. Berganzo, K. Mayora, J. Elizalde, A. Calle, C. Domínguez and L. M. Lechuga *"Microfluidic-optical integrated CMOS compatible devices for label-free biochemical sensing"* **Journal of Micromechanics and Microengineering.**

• M. Agirregabiria, F. J. Blanco, J Berganzo, A. Fullaondo, A. M. Zubiaga, K. Mayora and J. M. Ruano-López *"Sodium dodecyl sulphate-capillary gel electrophoresis of proteins in microchannels made of SU-8 films"* **Electrophoresis Journal.**

• G.Gª Mandayo, F. González, I. Rivas, I. Ayerdi, J. Herrán, *"BaTiO3-CuO sputtered thin film for carbon dioxide detection"*, **Sensors and Actuators A.**

• N.Arana, D. Puente, I. Ayerdi, E. Castaño, J. Berganzo, *"SU8 protective layers in liquid operating SAWs"*, **Sensors and Actuators** A.

• S. Olaizola, W.Fan, J-P. Wells, D. Mowbray, M. Skolnick, P. Parbrook, M. Fox, *"Time-resolved photoluminescence studies of carrier diffusion in GaN"*, **Applied Physics Letters.**

• B Sepúlveda, J Sánchez del Río, M Moreno, F J Blanco, K Mayora, C Domínguez and L M Lechuga. *"Optical biosensor microsystems based on the integration of highly sensitive Mach–Zehnder interferometer devices"*, **Journal of Optics A: Pure and Applied Optics.**

•J.M. Ruano-López, M. Aguirregabiria, M. Tijero, M.T. Arroyo, J. Elizalde, J. Berganzo, I. Aranburu, F.J. Blanco, K. Mayora. *"A new SU-8 process to integrate buried waveguides and sealed microchannels for a Lab-on-a- Chip"*, **Sensors and Actuators B, Vol. 114, nº1, pp.542-551 (2006)**.

• D. Puente, S. Arana, F.J. Gracia, I. Ayerdi, *"Thermal behaviour of freestanding microstructure by silicon frontside processing using porous silicon as sacrificial layer"* **IEEE Sensors Journal.**

• I.H. Brown, P. Blood, P.M. Smowton, J.D. Thomson, S.M. Olaizola, A.M.Fox, P.J. Parbrook, W.W. Chow, *"Time Evolution of the Screening of Piezoelectric Fields in InGaN Quantum wells"* **IEEE Journal of Quantum electronics.**

• G. García-Mandayo, *"Improved gas detection by tin oxide"* **Sensor Letters**.

• S. Merino, A. Retolaza, I. Lizuain, *"Linear optical encoders manufactured by imprint lithography"*, **Microelectronic Engineering 83, 897-901 (2006).**

• E. Abad Co-author of the review: *"New materials for micro-scale sensors and actuators – an engineering review"*. **Materials Science and Engineering, Elsevier (2006).**

• D. Gómez, I. Goenaga, *"On the incubation effect on two thermoplastics when irradiated with ultrashort laser pulses. Broadening effects when machining microchannels."* **Applied Surface Science 253, 22230-2236 (2006).**

Microfluidic Probe

Packaging

CIC biomaGUNE: a Newborn Singular Cooperative Research Centre in Biomaterials for the Economic and Social Growth of the Basque Country (Spain) Through the Generation of Scientific Knowledge and Technology Innovation

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Introduction

The Centre for Cooperative Research in Biomaterials - CIC biomaGUNE (**www.cicbiomagune.es**) located in Donosti-San Sebastián (Spain) was officially opened in December 2006. Cooperative Research Centres (CICs) are non-profit organisations whose mission is to contribute to the country's social and economic development by generating knowledge while trying to speed up the process leading to technological innovation. The main aim of CIC biomaGUNE is to produce, promote and apply scientific and technological knowledge in the biomaterials and molecular imaging fields by carrying out systematic research and experimental work in order to boost a new bioscience-based business sector in the Basque Country in the framework of the BioBasque 2010 strategy (**www.biobasque.net**). Established by the Department of Industry, Technology and Innovation of the Government of the Basque Country, CIC biomaGUNE constitutes one of the Centres of the CIC network, the largest Basque Country research network on specific strategic areas, which also includes CIC bioGUNE, CIC microGUNE, CIC nanoGUNE and CIC marGUNE. The transfer and dissemination of the results to social and business sectors are also part of the objectives of CIC biomaGUNE, its activities being open to third parties rather than restricted to its associates. The centre employs 54 people, 90% of whom being highly qualified research staff.

To develop the research programs, three Research Units - Biofunctional Nanomaterials, Biosurfaces and Molecular Imaging - comprising several laboratories led by an outstanding team of international scientists, have been already established. CIC biomaGUNE consists of ten research teams up to now. Apart of the basic instruments for the characterization of chemical substances (like FTIR, UPLC-MS, HPFC), CIC biomaGUNE has all the necessary equipments for the analysis and characterization of (bio)interphases: QCM-D, Scanning Probe Microscopes for AFM, Non-contact Microarraying Systems, TEM (equipped with STEM and EDX), SEM, RICM, SPR analysers, ellipsometers, Z-sizer and fluorescence instruments, among others. Furthermore, a P2 cell culture laboratory is also present. The NMR laboratory is equipped with a 500 Avance III Bruker spectrometer (coupled with an Automatic Sample Changer), along with a triple resonance 1H/13C/31P HR-MAS probe and a Minispec.

The Molecular Imaging Unit covers basic sciences and preclinical research and provides radioactive tracers to potential customers. It is equipped with the biggest technology platform in Spain. The facility includes an animal imaging department (with micro-MRI, micro-CT, micro-SPECT and micro-PET cameras, and 11.7T/16cm MRI) and a fully equipped radiopharmaceutical unit, equipped with an IBA 18/9 Cyclotron. This Unit counts with the necessary equipment to carry out studies in rodents, having a big animal facility that contains anesthesia equipments, biosafety cabinets and an area for microsurgery and dissection.

A science popularisation magazine promoted by the CICs, named CIC Network, is biannually published. Its mission is to transmit news about the world of science to the non-specialised public. It is possible to access the contents of the magazine in the website **www.cicnetwork.es**, after free of charge registering.

Keywords

Cooperative Research Centre; BioBasque 2010; Bionanotechnology; Biosurfaces; Biofunctional Nanomaterials; Molecular Imaging

Research Activities in CIC biomaGUNE

During its start-up phase, CIC biomaGUNE has established research programs at the interface between the chemical, biological and physical sciences with a main emphasis on molecular scale properties and applications of biological nanostructures. The final aim of these programs is to contribute to the understanding of the functioning of biological systems at a molecular and nanometer scale. The main research lines are within the field of design, preparation and characterization of biofunctional nanostructures to be used in the study of biological processes.

Biofunctional Nanomaterials Unit

The design, the construction and the characterization of biofunctional nanostructures that can readily interact with biomolecules, both on the cell surface and within the cell, constitute the main research topic of this Unit. The self-assembly fabrication of hybrid nanomaterials from inorganic nanostructures and biomolecules can provide interesting tools for mimicking biomolecules in cellular systems, probing the mechanisms of biological principles and developing chemical means for handling and manipulating biological components. These artificial bionanostructures may give rise to important biomedical developments within the emerging area of Nanomedicine ranging from nanoparticles for molecular diagnostics, including imaging, to targeted drug delivery and controlled release. The development of a new technology, named Glyconanotechnology **[1-2]**, in the laboratory of S. Penadés has allowed the establishment of a methodology to construct well defined water soluble three-dimensional polyvalent systems (glyconanoparticles) as a tool for studying biologically relevant interactions and for the development of new techniques of screening, diagnosis

and therapy. One of the research projects is devoted to set up the molecular basis of the binding between carbohydrates of the HIV envelop glycoprotein (gp120) and some of their specific receptors on the cellular surface (scientist in charge M. Martín-Lomas) by exploring the potential of glynanoparticles functionalized with synthetic oligosaccharides. This project also deals with the study of the capacity of these nanonclusters to generate specific antibodies, in order to create a potential platform for the deve-

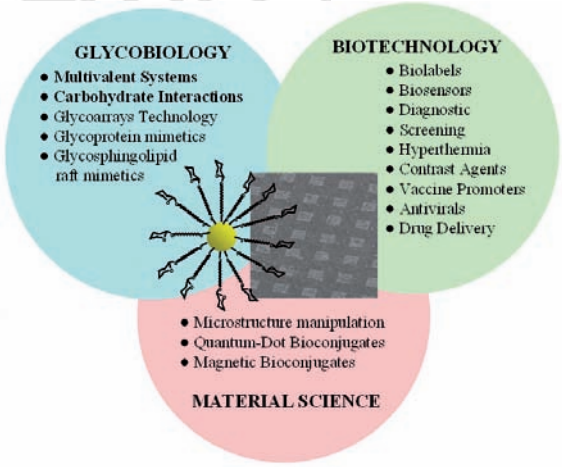

***Figure 1**: Glyconanotechnology: an example of multidisciplinary and translational project*

lopment of new type of vaccines, and to develop new microbicides able to block the HIV entrance through the mucosas. The synthesis and characterization of biofunctionalized magnetic nanoparticles and their biomedical applications (for example, as contrast agents in MRI) are other current topics based on the Glyconanotechnology (**Figure 1**).

The development of tools for the high throughput screening of Glycan-Lectin interactions is the main task of Niels Reichardt's laboratory, which is employing solid-phase and solution phase techniques to systematically synthesize glycan libraries for the interrogation of specific structural motifs in lectin binding assays. A detailed view of the binding events is obtained by biosensor experiments with selected oligosaccharides.

The design and preparation of new biomaterials for biomedical applications is the research theme of the group of Valery Pavlov. These biomaterials include complex artificial biochemical systems (multicomponent biocatalysts, signal-responsing and self-organizing/self-structuring biosystems) which can be used in targeted drug delivery and other medical applications; functional interfaces composed of biomaterials and nano-objects and supramolecular hybrid systems to solve biomedical challenges by means of bionanoengineering; aptamers and DNAzymes.

Biosurfaces Unit

The design and build up of biofunctional nanosurfaces on different supports to investigate relevant problems in biology and to understand and predict the interactions of living cells with materials constitute the general research topic of this Unit. Biosurfaces and biointerfaces represent an emerging area that lies at the interface of bioscience and nanoscience. Present knowledge of the structure and the function of biomolecules combined with the ability to immobilize them at surfaces while retaining their functionality has opened a new area of research on biomimetic materials, enabling applications ranging from biosensors to integrated medical nanosystems to perform complex repair actions at the cellular level.

The interface between hard (inorganic) materials and soft, self-assembling biologically relevant systems is investigated in the group of I. Reviakine for understanding the nanoscale phenomena that govern their dynamics and for developing their applications in the areas ranging from structural biology to biocompatibility and biosensor development. Lipidic systems (as models for biological membranes), suitable environment for incorporating functional transmembrane proteins, and surface modification agents, are the main focus of the work performed with the combination of "wet" and ultra-high vacuum microscopic and spectroscopic techniques.

Understanding interfacial phenomena in bio- and biomimetic systems of variable structural complexity is the research aim of J. L. Toca-Herrera's group. The approach makes use of multicomponent, self-assembled scaffolds like polymer capsules, colloidal particles and planar surfaces, which are internally and/or externally decorated with biomolecules - e.g. enzymes, (fusion)protein crystals **[3-4]**, (**Figure 2**) - cells and tissues. These hybrid systems are used as models to investigate biocompatibility of interfaces, interactions between non-like molecules important in life science and mechanical stability at the nano and microscale. A concomitant objective is the generation of artificial cells by engineering phospholipid vesicle compartments inside hollow polyelectrolyte capsules and the exploration of applications of these hybrid systems in biosensing and biomedicine.

The nanofabrication and the study of nanoscale physicochemical properties of the (bio)materials which result from the nanostructuration are the research topics of S. Moya's

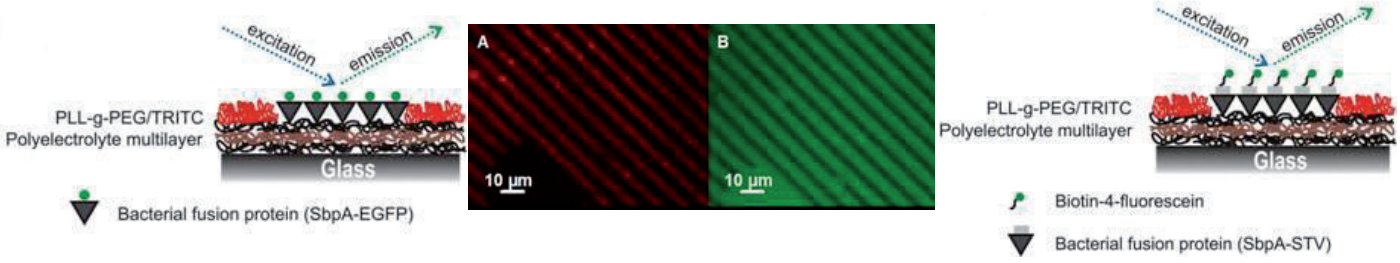

Figure 2**: Example of a multi-component, planar system composed of bacterial fusion proteins deposited on a fluorescent patterned polyelectrolyte multilayer **[3]

CIC biomaGUNE

Centre of Cooperative Research in Biomaterials

CIC biomaGUNE is a non-profit association located in San Sebastian, Spain, with the basic aim of creating, producing, promoting and applying scientific and technological knowledge in the biomaterials field by carrying out systematic research and experimental development work.

It will also encourage the transfer and dissemination of results to social and business actors in many sectors. Its activities are open to third parties rather than being restricted to its associates.

CIC biomaGUNE intends to carry out the following activities (among others):

- Guided and strategic basic research
- High level training
- Technology transfer to enable research results to be exploited and used by society as a whole.

Biofunctional Nanomaterials

Biosurfaces

Molecular Imaging

CIC biomaGUNE

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group. The laboratory deals with the design and fabrication of complex surfaces and colloidal systems (nanoparticles, nanowires, latexes, capsules), whose structure and properties can be controlled in nanometric scale, and with the biomedical applications of these systems. In parallel to this work, the study of weak interactions and the use of hydrogen and coordination bonding in nanofabrication are also performed.

Lipid membranes and the gel-like, polysaccharide-rich coats that surround many cells are two types of biological assemblies which R. Richter's group is interested in. For investigating the physical principles underlying the structure and function of these architectures, surface-based model systems with tuneable complexity are created. Modern techniques of surface nanostructuration and biofunctionalization are employed to guide the assembly down to the nanometer scale. For the characterization of such model systems, novel biophysical in situ analytical techniques are developed. The created structures are employed as specialized platforms for biosensors and for the control of cellular fate **[5]**.

Molecular Imaging Unit

This Unit will be fully operative at the end of 2008 and its research activity is focused on the development of new radiotracers for early diagnosis of disease such as Alzheimer and Parkinson, and on the development of new imaging techniques for monitoring drug delivery, studying the pharmacokinetics of new drugs, among other applications **[6,7]**.

Conclusions

CIC biomaGUNE is a newborn research centre focussed on the biomaterials and molecular imaging fields. Thanks to its extraordinary facilities, CIC biomaGUNE intends to carry out the following activities (among others): strategic basic research, high level training, and technology transfer to make research results exploitable by society as a whole. The Cooperative Research Centres cooperation-based philosophy, as well as the strategic coordination between CIC bioGUNE and CIC biomaGUNE and their respective locations in two Technology Parks in the Basque Country Technology Park Network, are unprecedented in the Spanish Science and Technology sector.

References

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[2]*Nanoparticles*. Penadés et al. **PCT/GB01/04633 WO 02/032404 A3**
[3]Saravia V. et al. **J. Biotechnol. 2007, 130, 247-252**
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IMDEA Institute for Advanced Studies in NanoScience

IMDEA Nanociencia

The "Instituto Madrileño de Estudios Avanzados en Nanociencia" (IMDEA-Nanociencia) (Madrid's Institute of Advanced Studies in Nanoscience) is a private Foundation created by a joint initiative of the regional Government of Madrid and the Ministry of Education of the Government of Spain in February 2007. Both institutions share the main financial support of the Foundation with a long term commitment. The Foundation manages the IMDEA-Nanociencia, a new interdisciplinary research centre dedicated to the exploration of basic nanoscience and the development of applications of nanotechnology in connection with innovative industries.

The Foundation is governed by a Board of Trustees, which contains representatives of the Administration, the Academic Institutions involved (Universidades Complutense, Autónoma, Politécnica de Madrid, Consejo Superior de Investigaciones Científicas), industries, members of the Scientific Advisory Council, and experts in societal implications of nanoscience and technology transfer.

The Foundation and the Institute are located in the campus of the Universidad Autónoma de Madrid in Cantoblanco, 12 kilometres away from Madrid downtown, on the highway to the Sierra. The campus has excellent communication by public transportation with the Madrid-Barajas airport (25-30 min) and Madrid downtown (15-20 min).

The Foundation is run by a flexible, professional management structure and works for a closer interaction of scientists in the IMDEA-Nanociencia and companies in the region of Madrid and elsewhere. The common efforts to generate joint research projects are focused into specific proposals by a qualified staff.

The main tasks of the Institute, however, are the recruitment of new scientific talent and its organization into research teams provided with first line equipment and infrastructure, able to tackle specific scientific problems in basic nanoscience and certain nanotechnologies.

To this end, the Foundation obtains financial support from institutions such as the Regional Government of Madrid and the Government of Spain, from competitive research funds of national and international origin and from contracts with private companies.

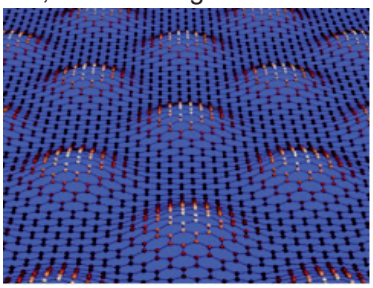
The scientific (Ph. D students, postdocs, junior and senior scientists), technical and administration personnel of the Institute is contracted by the Foundation through public, competitive processes, subjected to periodic scientific evaluation and salary revision.

Research programs in the IMDEA-Nanociencia Institute will focus on six key areas:

Molecular NanoScience

1.1.Design and Synthesis of Molecular Nanomaterials and Molecular Nanostructures.

The preparation of molecular nanostructures requires the previous design of suitably functionalized molecules able to form complex systems by means of covalent or supramolecular approaches, determining the nanomorphology of the material and, therefore, its properties.



Graphene

This scientific program at IMDEA-Nanociencia emphasizes the functionalization of different nanoforms of carbon, organometallic and metaloorganic compounds or supramolecular ensembles in order to explore their intriguing physical, electrochemical and photophysical properties and applications. The structural modification of naturally occurring molecular machines will also be explored to understand energy conversion, information storage and mechanical transportation mechanisms at the molecular level.

1.2.Atomic and Molecular Self-assembly at Surfaces and Spectroscopy on Molecular Systems.

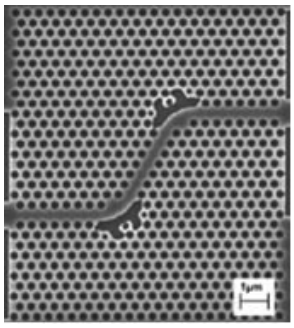
Organization at the nanoscale through the construction of self-assembled monolayers and porous organic and hybrid materials is essential for the fabrication of optoelectronic devices or the chemical functionalization of solid surfaces for biocompatible implants.

In order to understand the driving forces and atomistic mechanisms involved in the building of complex systems, IMDEA Nanociencia scientists have focussed their investigations on single-molecule behaviour. Advanced microscopies and spectroscopies such us low-temperature AFM and STM under UHV conditions, HRTEM, Photoelectron Microscopy (PEEM) have become the tools of choice to identify individual molecules in order to accomplish their manipulation.

Nanoelectronics, Nanophotonics and Quantum Information

2.1.Quantum Optics Information with Semiconducting Structures.

Superconductors, magnetic and semiconductor materials are candidates to be the physical basis of quantum information. Semiconductors present the advantage that storage and manipulation of quantum information can be efficiently made in the charge and spin degrees of freedom, while the essential question of quantum information transmission is better solved by means of quantum optics techniques.



Photonic crystal

Growth by MBE of semiconducting nanostructures and nanodevices, quantum dots and cavities in nanopillars or photonic crystals, polariton superfluids, and quantum optics with carbon nanostructures will be explored at IMDEA Nanociencia.

2.2.Nanooptics and Nanophotonics.

Nanophotonics have to do with phenomena in which either the radiation or the matter are confined at submicrometer dimensions. Today, the field is both a Nobel Prize-winning science and a multibillion-dollar industry, underpinning applications such as telecommunications, data storage, flat-panel displays and materials processing. Nanostructures and nanostructured materials exhibit fascinating optical response and nanoscale-optics has already shown many surprises, such as extraordinary optical transmission, superlensing, giant field enhancement, optical trapping, imaging with resolution far beyond the diffraction limit,…

Some present and future prospects at IMDEA-Nanociencia include semiconducting nanoparticles as biolabels, nanoparticle-based photochemistry, coherent light-matter interactions and electromagnetically induced transparency, plasmon based devices and photonic nanocrystals for protein tracking.

2.3.Electric Transport in Nanosystems.

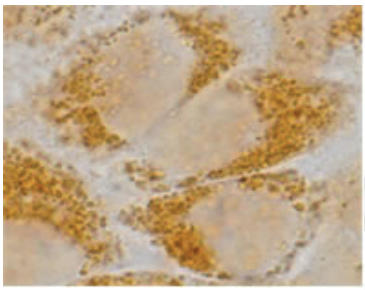
The semiconductor industry based on silicon will soon reach its fundamental scientific and technological limits. Alternative approaches involve devices based on graphene nanostructures (carbon nanotubes or two-dimensional graphene layers) or transport through single molecules with a systematic variation of functionality (redox- or photo-switching behaviour, magnetic moment), spacer units (length, conjugation and flexibility) and anchor groups (to tune the electronic coupling between molecules and electrodes).

Nanomagnetism and its Biomedical Applications

3.1.Magnetic Nanomaterials.

The final properties of current and future devices based in magnetic nanostructures are the outcome of complex materials nanoengineering, involving the tailoring of artificial systems, interfaces, and the exploitation of effects of low dimensionality.

Major issues to be explored at IMDEA-Nanociencia are the preparation of advanced magnetic nanomaterials with novel properties, the nature of the domain structure in magnetic nanosystems or the interaction of spin currents with nanostructures and domain walls.



Magnetic nanoparticles inside tumoral cells

Spin-Polarized STM and different magnetometries are available.

3.2.Biomedical Applications.

In the last decades, the preparation of bioactive magnetic nanoparticles has emerged as an important research line for the developing of smart biosensors for quicker, ultrasensitive NMR molecular imaging agents, magnetic carriers for in vivo targeting of therapeutic compounds to specific targets within the body or hyperthermia treatment of cancer.

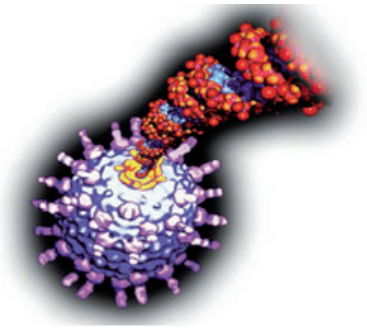
Nanoscience at Very Low Temperature

Mesoscopic superconductors fabricated as superlattices,

nanowires and nanodots are a promising subfield in the nanoworld. Confinement and proximity phenomena between superconductors and normal conductors, magnetic materials, or semiconductors affect superconductivity in nanosystems in fundamental ways. Within the proximity length, these interaction effects are a powerful tool to alter and design new materials properties

Biomachines and Manipulation of Macromolecules

IMDEA Nanociencia aims at performing individual molecule analyses in biological systems so that biologically relevant questions could be addressed. Some of the very relevant and active research areas in biology will be represented in the Institute: molecular machines capable of performing mechanical work driven by chemical energy (DNA processing systems, DNA-packaging systems, bacterial cell division motor proteins) and self-organizing systems with highly specialized functions and properties (biological membranes, protein folding, viral assembly, bacterial cytoskeletal systems, DNA structure). Of interest is the study of single molecule analysis of macromolecular complexes using atomic force microscopy under different environmental conditions (static and dynamic imaging), force spectroscopy analysis and manipulation of macromolecules and their aggregates, study of nano-mechanical properties of biological assemblies and optical trapping-based approaches for the study of the mechano-chemical properties of biomolecules (optical tweezers).

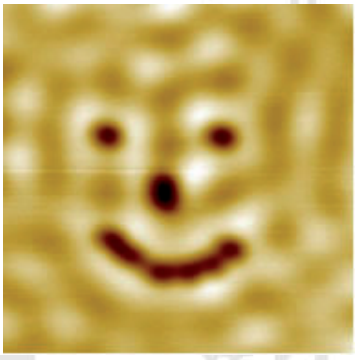


Biological molecular motors

Nanofabrication and Advance Instrumentation

Many of the experimental lines mentioned above need the development of specific, advanced instrumentation, which includes the use of very low temperatures and very high magnetic fields, as key, enabling tools for nanoscale science and technology.

On the other side, availability of samples and techniques for sample preparation and characterization are vital to the Institute activities. Thus, fabrication, patterning and processing techniques at the nanoscale, such as Molecular Beam Epitaxy (MBE), Chemical Vapor Deposition (CVD) or Pulsed Laser Deposition (PLD), Focused Ion Beam (FIB) and electron beam lithography will be available at IMDEA-Nanociencia.



Molecular smile assembled with the Scanning Tunnelling Microscope tip

ciber-bbn

Centro Investigación Biomédica en Red

Bioingeniería, Biomateriales y Nanomedicina

What is a CIBER? A CIBER is a National Biomedical Research Center Network designed to be a translational research center with a multidisciplinary and multi-institutional nature made up of basic, clinical and technological research in a specific research area for the purpose of developing a single common research program relevant for the Spanish National Health System. At present there are nine CIBERs in existence working in the following areas: liver and digestive diseases, epidemiology and public health, obesity and nutrition, rare diseases, respiratory diseases, neurodegenerative diseases, mental health and diabetes and metabolic diseases. Every CIBER is a consortium of the institutions to which the groups forming the CIBER belong plus Instituto de Salud Carlos III. This institute is responsible for coordinating biomedical research on a national level and depends on the Ministry of Health and Consumer Affairs of the Spanish government.

Why CIBER-BBN? CIBER-BBNN was created for the following main reasons:

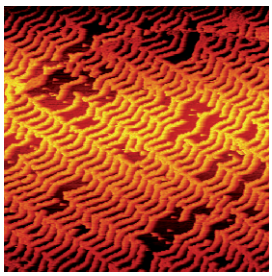
- Importance of biomedical technologies within the entire health system (diagnosis, therapies, follow-up, rehabilitation) with an enormous social and economic impact.
- Alignment with European research priorities included in the 7th Framework Programme.
- Reduced transfer and interaction of research agents with the Health System.
- Relatively low development of this industrial sector in Spain.
- Need for considerable resources to develop the sector, greatly depending on the size and synergies.
- Different precedents (SEIB, SEB, PTNanomed, IM3, RedinBio).
- Similar initiatives in other countries: National Institute of Biomedical Imaging and Bioengineering (NIBIB-NIH) or the proposed network of European health technology centers promoted by EUCOMED.

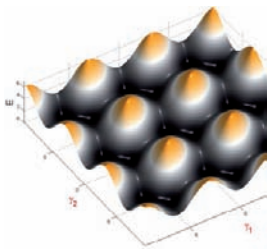
What is the purpose of CIBER-BBN? The general objectives of CIBER-BBN are specified below:

- To increase research capabilities of the component groups (sharing resources, coordination and promotion of synergies).
- To enhance greater and better use of advanced technologies in the National Health System.
- To improve the technological level of national industry in this field.
- To favor the emergence of specialists with a high level of training in health technologies.
- To increase the presence of Spain in decision-making forums and international research networks in this

imdea nanociencia

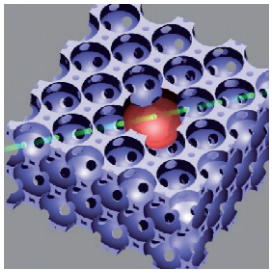
Molecular Nanoscience
Array of PCBM molecules on Au (III)

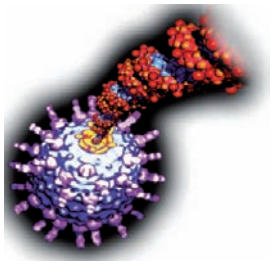




Nanoscience at very low temperatures
Potential landscape of a superconducting qubits

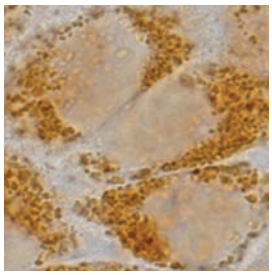
Nanoelectronics Nanophotonics
Photonic crystals

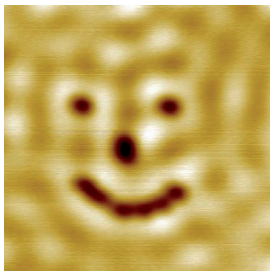




Biomachines and manipulation of biomolecules
Biological molecular motors

Nanomagnetism and the biomedical application of magnetic nanoparticles
Magnetic nanoparticles inside tumoral cells

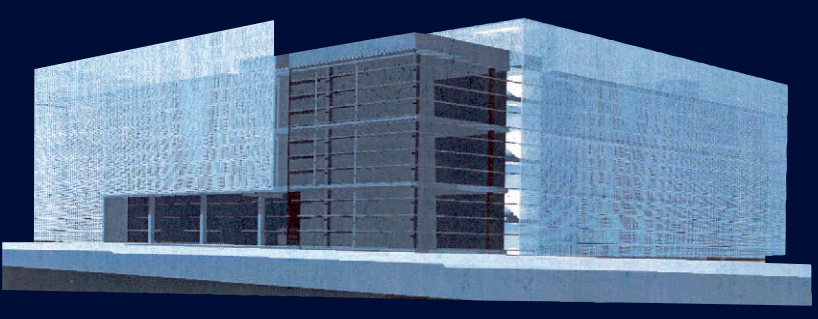




Nanofabrication and advanced instrumentation
Molecular smile assembled with STM

IMDEA- Nanociencia is a private Foundation created by joint initiative of the regional Government of Madrid and the Ministry of Education of the Government of Spain in February 2007 to manage a new research Institute in Nanoscience and Nanotechnology (IMDEA-Nanociencia), which is located in the campus of the Universidad Autónoma de Madrid, 12 km away from Madrid downtown with an excellent communication by public transportation with the Madrid-Barajas airport (25-30 min) and Madrid downtown (15-20 min).

The Institute offers attractive opportunities to develop a career in science at various levels from Ph.D. students to senior staff positions.



Contact

Madrid Institute of Advanced Studies in Nanoscience (IMDEA-Nanociencia)
Facultad de Ciencias, C-IX, 3rd floor
Campus de Cantoblanco Madrid 28049 Spain

Phone 34 91 497 68 49 / 68 51 / 68 54 Fax 34 91 497 68 55
contact@imdea.org
For further details see http://www.imdea.org

field.

Who is part of CIBER-BBN? CIBER-BBN is formed by various research groups which generally belong to public and private institutions and are selected purely on the basis of their scientific excellence and adaptation to the fields in which the CIBER is active. These groups were selected in a national call for proposals by an international panel of experts based on their scientific production, international recognition and capacity to transfer their results to the biomedical field. It is currently formed by 46 core groups and 3 more associate groups all belonging to universities, research centers, hospitals and technological centers.

CIBER-BBN Research Program? CIBER-BBN is the only network that is not dedicated to a group of specific pathologies or epidemiology - it responds to a more horizontal purpose, such as the research and development of the use of technologies in the biomedical field both today and for the future. Therefore, CIBER-BBN has been legally appointed the task of carrying out (basic, technological and clinical) research and technological development activities in relation to the following descriptors: Telemedicine; Molecular Imaging Techniques in Medicine; Tissue Engineering; Nanostructures and Drug Release; Biocompatible Nanoparticles; Biological Nanosensors; Implantable Nanomachines and Nanorobots for Biomedical Diagnosis. It therefore focuses its research on developing prevention, diagnosis and follow-up systems, as well as on technologies related to specific therapies with an emphasis on several aspects of Regenerative Medicine and Nanotherapies. Three research areas and a series of main lines of research in each of these areas have been chosen and are described below:

Main lines of research in Bioengineering and Biomedical Imaging

- Biomedical Imaging Diagnosis: molecular imaging, multi-modal imaging and co-recording, functional tissue modeling and imaging integration.
- New methods for the prevention, early diagnosis, monitoring and telecontrol of patients within specific risk groups (cardiovascular and kidney diseases, diabetes, neurological and neurodegenerative diseases, cancer and other chronic pathologies).

Main lines of research in Biomaterials and Tissue Engineering

- Design, characterization and manufacture of scaffoldings for applications in bones, cartilage, etc. (control of porosity and mechanical properties, surface biofunctionalization, interaction with cell cultures, integral scaffolding-cell-tissue modeling).
- Tissue adaptation and repair. Regenerative medicine (tissue remodeling, adaptation and self-repair, bone integration, endothelial expression and growth, epigenetics and cell mechanobiology).

Main lines of research in Nanomedicine

- New nanosystems for imaging and molecular diagnosis (development, characterization and validation of new biomarkers and nanoparticles for contrast, nanobiosensors and “lab-on-a-chip”).
- New drug release systems and nanotherapy (development, characterization and validation of new nanoparticles and nanostructures for drug release, biofunctionalization, nanomagnetism and hyperthermia).

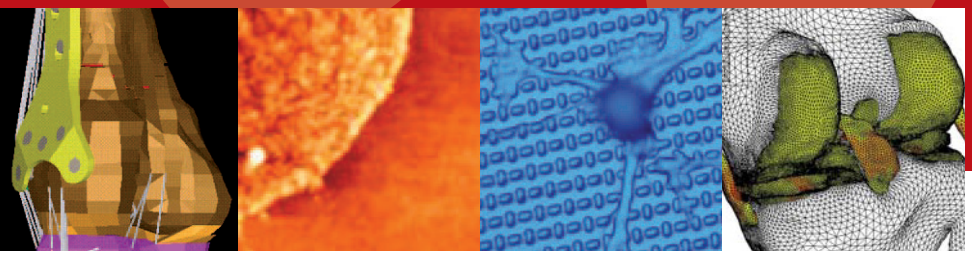
Scientific plan 2007-2009. Our plan for this period consists of the following programs:

I) RESEARCH PROGRAM. This is CIBER-BBN’s primary activity plan and is set on a group of collaborative projects. These projects defined for the 2007-2009 period are described below:

Project	Objetive
PREDIRCAM	Intelligent platform for a drug-free prevention of diabetes mellitus and cardiometabolic risk
VPHTk	Multi-type biomedical information integration toolkit, biomodeling and biosimulation techniques: customization of multi-physical simulations in the cardiovascular system
BIO-SCAFF	Development of new concepts of scaffoldings and cell cultures for regenerative medicine, with applications in the vascular system, abdominal hernias, articular cartilage and fibrocartilage, bones and diseases of the ocular surface.
FABRY	Enzyme replacement therapy in Fabry’s disease: new nanoconjugates with therapeutic activity
MICROPLEX	Obtaining biosensors for identifying pathogenic microorganisms with diagnostic uses
ESTR_IM	Development of molecular imaging strategies and of in vivo animal model phenotypes of human pathologies. Translational extension to patients
NANOMAG	Development of a technological platform providing magnetic nanoparticles with various compositions, sizes and shapes that are stable in biological mediums and have perfectly characterized magnetic behavior.
MONIT_IM	Design of a cell system molecular imaging monitoring base model aimed at nanocontrol in biomedical applications
GLAUCO	Sensing contact lens make with micro nanotechnologies for the non-invasive monitoring of intraocular pressure

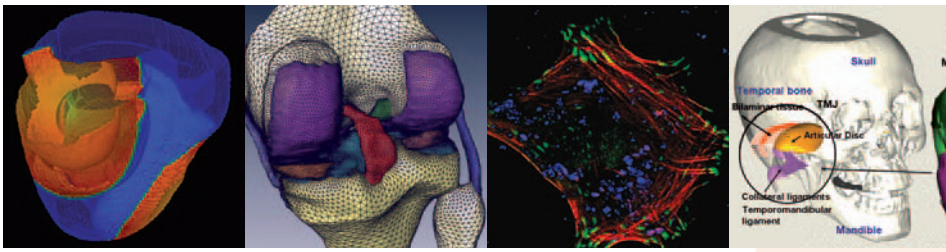
II) TRANSLATIONAL RESEARCH PROGRAM. This program relates to the transfer and interaction with the health system which on one hand attempts to undertake clinical objectives of the health system relating to CIBER-BBN’s target technologies, and on the other to promote transferring of the CIBER research results to the clinical field.

III) INDUSTRIAL TRANSFER PROGRAM. The purpose of this program is to work closely with the industry and sui-



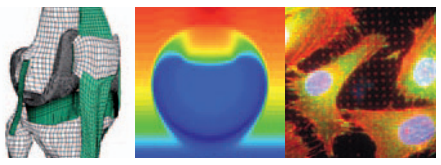
WHAT IS A CIBER?

A CIBER is a National Biomedical Research Center Network designed to be a translational research center with a multidisciplinary and multi-institutional nature made up of basic, clinical and technological research in a specific research area for the purpose of developing a single common research program relevant for the Spanish National Health System. At present there are nine CIBERs in existence working in the following areas: liver and digestive diseases, epidemiology and public health, obesity and nutrition, rare diseases, respiratory diseases, neurodegenerative diseases, mental health and diabetes and metabolic diseases. Every CIBER is a consortium of the institutions to which the groups forming the CIBER belong plus Instituto de Salud Carlos III. This institute is responsible for coordinating biomedical research on a national level and depends on the Ministry of Health and Consumer Affairs of the Spanish government.



WHAT IS CIBER BBN

CIBER BBN (Networking Research Center on Bioengineering, Biomaterials and Nanomedicine) is the only network that is not dedicated to a group of specific pathologies or epidemiology – it responds to a more horizontal purpose, such as the research and development of the use of technologies in the biomedical field both today and for the future. CIBER BBN has been appointed the task of carrying out basic, technological and clinical research and technological development activities in relation to the following descriptors: Telemedicine, Molecular Imaging Techniques in Medicine, Tissue Engineering, Nanoestructures and Drug Release, Biocompatible Nanoparticles, Biological Nanosensors, Implantable Nanomachines and Nanorobots for Biomedical Diagnosis. Three research areas have been chosen to develop those descriptors: Bioengineering and Biomedical Imaging, Biomaterials and Tissue Engineering and Nanomedicine.



ciber-bbn
Centro Investigación Biomédica en Red
Bioingeniería, Biomateriales y Nanomedicina

María de Luna, 11. CEEI-Módulo 3
50018 Zaragoza
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Fax (+34) 976 51 23 68
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www.ciber-bbn.es

MINISTERIO DE SANIDAD Y CONSUMO
Instituto de Salud Carlos III

tably transfer the research results in a manner that is profitable for both CIBER and the industry, as well as to promote the emergence of a more powerful industrial framework in our country.

IV) TRAINING PROGRAM. The objective of this program is to promote the internal training in CIBER and the external training with new training proposals in collaboration with universities and other training agents for the purpose of obtaining specialists in the CIBER-BBN's fields of activity in the near future.

V) EQUIPMENT PROGRAM. The objective of this program is to improve scientific infrastructures of the component groups of CIBER, as well as to prevent unnecessary repetitions, increasing the expense efficiency through means sharing, broad-spectrum service centralization, increasing the research possibilities within CIBER, and the possibility of offering specialized services outside of CIBER. Five equipment platforms have been created:

- High-performance computing.
- Nanomedicine: Protein production, Biodeposition, Monoclonal antibody production, Rapid prototyping, Molecular detection, Compressed fluids, E-beam.
- Tissue characterization.
- In vivo experiments.
- Magnetic resonance and nanoparticles.

VI) DIFFUSION PROGRAM. The objective of this program is to spread word about CIBER-BBN's activity not only in the scientific community through standard means, but also in society as a whole by suitably spreading word about its achievements and their importance, as well as mid and long-term objectives.

CIBER BBN Figures

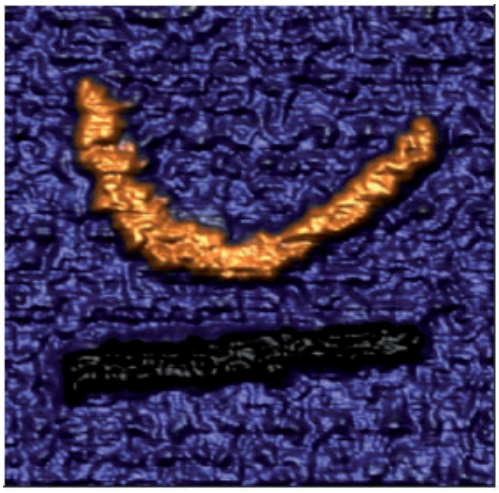
Yearly Budget: 7.700.000 Euros
Core Investigators: 200
Associated Investigators: 750
49 Groups: Universities (28) Hospitals (9) Others (12)

Developing Atomic Force Microscopes for all the Applications

Rafael Fernandez, CEO
Adriana Gil, Research Manager

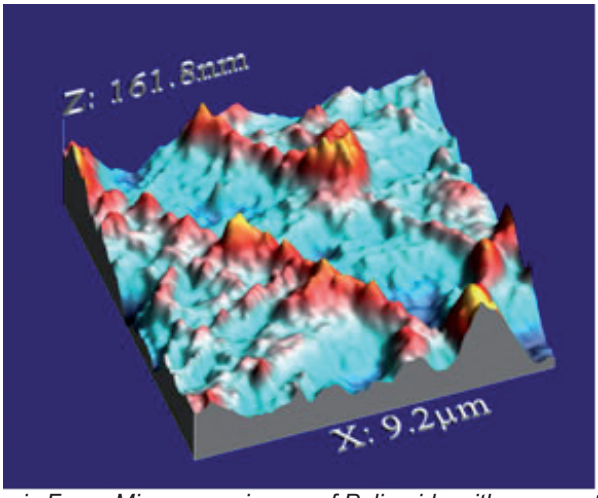
Keywords: Atomic Force Microscopes, Scanning Probe Microscopes, Scanning Tunneling Microscopes, Nanotechnology.

Nanotec Electronica develops Scanning Probe Microscopes (Nanotec Cervantes FullMode AFM, as our main product) with the best quality and the latest technology in the field, giving easy access to the nanometer scale both to the scientific and industrial communities. Also, Nanotec Electronica manufactures control systems (Dulcinea control system), for Scanning Probe Microscopes, develops the free WSxM software for data visualization and processing of Scanning Probe Microscopy images, and distributes the SIESTA DFT software for first principle calculations.



1μm x 1μm nanolithography of Nanotec's logo

Scanning Probe Technologies allows the study of surface characteristics at the nanoscale for very different materials and samples and has become a key tool for nanotechnology development. These technologies are used for performing topographical analysis, including height distribution and roughness measurements, and characterisation of many other surface properties such as adhesion or stiffness, electrical conductivity or charge distribution, magnetic domains, etc.



Atomic Force Microscope image of Poliamide with nanoparticles (Image size: 9,2 μm x 9,2 μm). Measured in Dynamic Mode. Courtesy of GAIKER (Bilbao, Spain)

Nanotec Electronica: A small company with a large R&D

In the 20 years from the installation of the first STM microscope in Madrid, a lot of new ideas came to the Scanning Probe Microscopy world, and Scanning Probe Microscopes assented as one of the main tools for Nanotechnology. While maintaining the idea that the SPM should be not very expensive in order to allow access for the technology to any laboratory in the world, Nanotec Electronica maintains its products in the cut edge of the developments, offering the most flexible and powerful SPM system in the market.

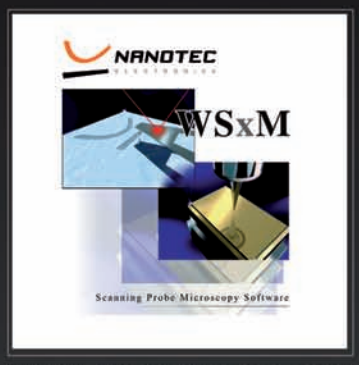
The 15 employees size of Nanotec Electronica are the

NANOTEC
ELECTRONICA

Single human Rad50/Mre11 protein complex bound to a DNA molecule.
Image size 100 nm x 100 nm
Moreno-Herrero et al. Nature. 437, 440-443 (2005).

Nanotec Cervantes FullMode Atomic Force Microscope

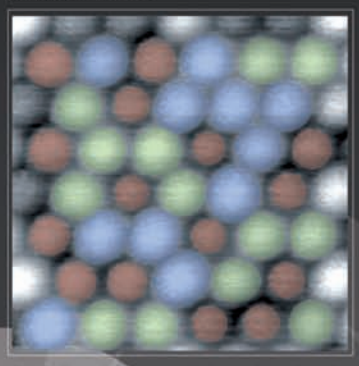
The nanotechnology research tool



WSxM: FREE Software for SPM data processing available at http://www.nanotec.es

The only AFM with Jumping Mode and Frequency Modulation

The unique designed to work with the famous WSxM



Atomically resolved topographic image of a surface alloy made up of silicon (red), tin (blue) and lead atoms (green) blended in equal proportion on a Si(111) substrate.
Image size 4.3 nm x 4.3 nm
Y.Sugimoto et al. Nature 446 64-67 (2007)

Cervantes FullMode AFM

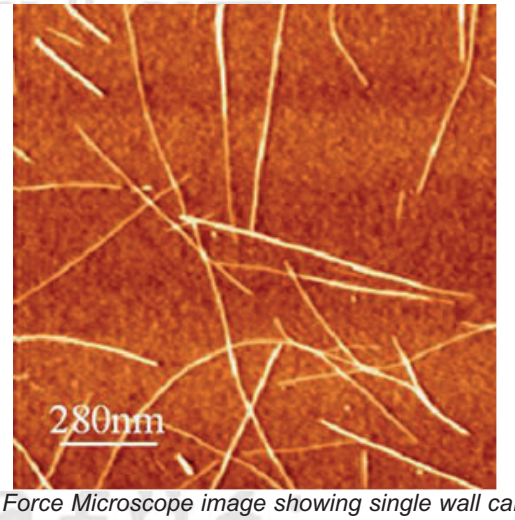
Tested stability: Atomic periodicity in each quality control
Open and accessible: For full understanding and custom experiments

Dulcinea SPM Control System

Powerful: Subatomic resolution and UHV-NCAFM control with integrated PLL
Flexible: Configurable for any SPM (AFM, STM, SNOM, air, liquid, UHV, commercial, home-made...)

www.nanotec.es

Contact our distribution network in: Europe: sales@nanotec.es USA: info@nanotecusa.com Japan: info@teko-nano.jp India: info@labline.in China: GM@sinowaytech.com

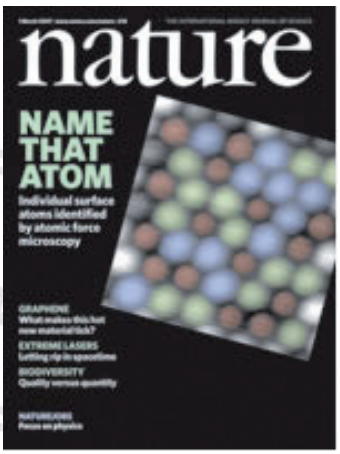


Atomic Force Microscope image showing single wall carbon nanotubes (Image size: 1,4 µm x 1,4 µm).
Courtesy of Pedro J. de Pablo. UAM . Madrid (Spain)

exact number for a strong R&D combined with the flexibility and fast reaction of a small company. Nanotec R&D has been driven by the customer needs during 10 years, and it continues upgrading the possibilities of the products in all the fields in which SPMs can be used. These R&D activities range from Ultra High Vacuum (UHV) advanced technics for atomic resolution in solid materials to soft biological samples in liquid environment, extending to chemistry, nanolithography, nanoindentation, spectroscopy, dynamic processes, etc.

First STM in Spain. Autónoma University. Madrid

In the last year, the most impressive advance inside the SPM technique has been obtained combining our WSxM software and our Dulcinea electronics with the UHV AFM systems in the group of Prof. Seizo Morita in the Osaka University. The three years of collaboration developing nanomanipulation techniques demonstrated success with the publication of the front cover of the prestigious Nature scientific review on March 2007.



Copyright Macmillan Publishers Ltd 2007.
Cover of the 2007, 1st of March issue of Nature devoted to the chemical identification of individual atoms by atomic force microscopy.
Sugimoto et al. Nature 446, 64-67 (2007)

So, Nanotec Electronica keeps strong collaboration with research groups in Europe, USA and Japan, which allow not only Nanotec systems to be the better adapted

Nanotec Cervantes FullMode AFM

for scientific and industrial needs in any field, but also Nanotec customers to have their systems continuously updated with the most recent advances.

Conclusion: Not all the AFMs are the same

As you can imagine after reading this article, at Nanotec Electronica we consider that R&D is the most important part of a technological company like ours, and should be not limited to one or two particular fields, but directed by the own users of the technology in order to open the newest fields. Nanotec Electronica AFMs are designed to cover any need that the user has, not only the first day, but during years of measurement. If you want to know more about Nanotec Electronica, please go to our web page **http://www.nanotec.es**, and download our free WSxM software. You will be able to process almost any SPM data that you can find, and you will discover the versatility of our products. After trying WSxM, you will sure be eager to use it to control the Cervantes FullMode AFM or any other SPM in combination with the Dulcinea control system. If you think that your SPM could give you more than it does, call us.

WSxM Nanotec FREE Software

Mission

Endor Nanotechnologies is a company devoted to R&D in Nanomedicine and Bionanotechnology. Our mission is to develop research projects for the pharmaceutical and biomedical industries.

Endor Nanoparticles and other selected nanomaterials are our unique products to improve decisive features of current therapies and diagnosis tools. Also, Endor scientific team is highly talented to design novel ones.

Keywords

- Nanomedicine
- Bionanotechnology
- Nanomaterials
- Bioconjugation
- Cosmetics
- Diagnosis
- Drug Delivery
- Oncology

Endor People

- Joaquin Querol Sastre (CEO)
- Marc Ramis Castelltort (R&D Manager)
- Isaac Ojea (Lab Manager)
- Victor Puntes (Scientific Advisor)
- Javier Fernández (Finance Advisor)

Client Perspective

Endor focuses its activity in some medical areas (e.g. oncology), new cosmetics creations and pioneer nanomaterials for biological applications.

Each proposed project includes R&D strategies designed with our expertise in the nanotechnology field. The R&D department is oriented to create a novel generation of products that are becoming decisive as part of biomedical applications or cosmetic treatments.

Currently, our pipeline has two initiatives focused to the cosmetic industry. *Endor Dermatology I* consists on the production of nanoparticles conjugated to selected peptides for improving their activity, efficacy and selectivity. This project includes several nanoparticle-peptide products for different aesthetic treatments.

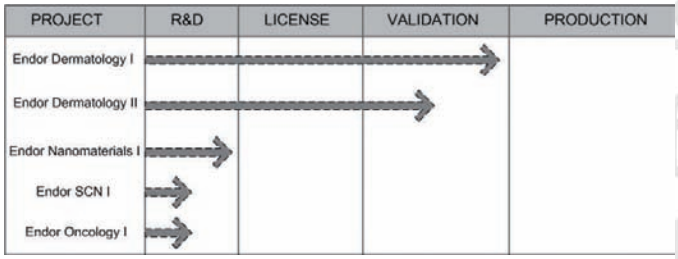
Endor Dermatology II is an in-house project that develops inorganic nanoparticles conjugated to a key molecule with outstanding hydrating properties for several cosmetic applications. These conjugates are suitable for being part of a new generation of lipsticks, anti-wrinkles treatments and other cosmetic applications.

Endor Nanomaterials I strategy consists on the production of novel nanoparticles composed of a magnetic core and a biocompatible shell. This exceptional nanomaterial offers crucial properties for diagnosis, research tools and drug delivery systems.

Endor offers great values of innovation, strategic vision, market oriented R&D and a fluent communication with our clients. Furthermore, Endor is capable to manufacture the products developed in our projects.

Project Development

Currently, Endor is working in several projects related to our areas of interest. We have a balanced and diversified pipeline:



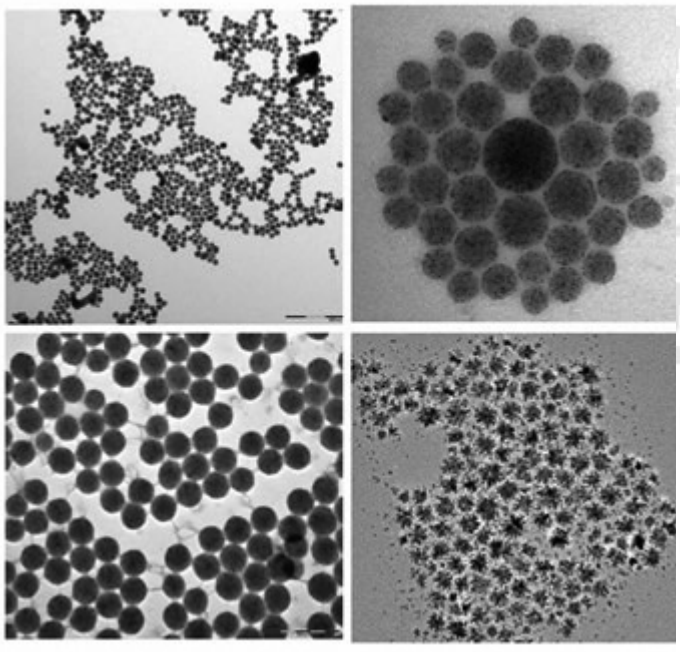
Platform Technology for the first generation of products

Our platform technology is based on the production of bioconjugated nanoparticles for selected medical and biological applications.

Endor biocompatible nanoparticles have unique properties that make them ideal to use them as local nanoprobes or nano-manipulators in biological and medical applications (e.g. magnetic particles as contrast agents, magnetic separation and targeted drug delivery).

The related behaviour of monodisperse nanoparticles and organic molecules, and the ability to produce number of Avogadro of them, makes desirable to dispose of an extended catalogue of size, shape, composition and structure controlled nanoparticles with customized properties. (In exchange, development of new synthesis protocols allows exploring hypothesis on the basis of nanocryrstal nucleation, growth and stabilization).

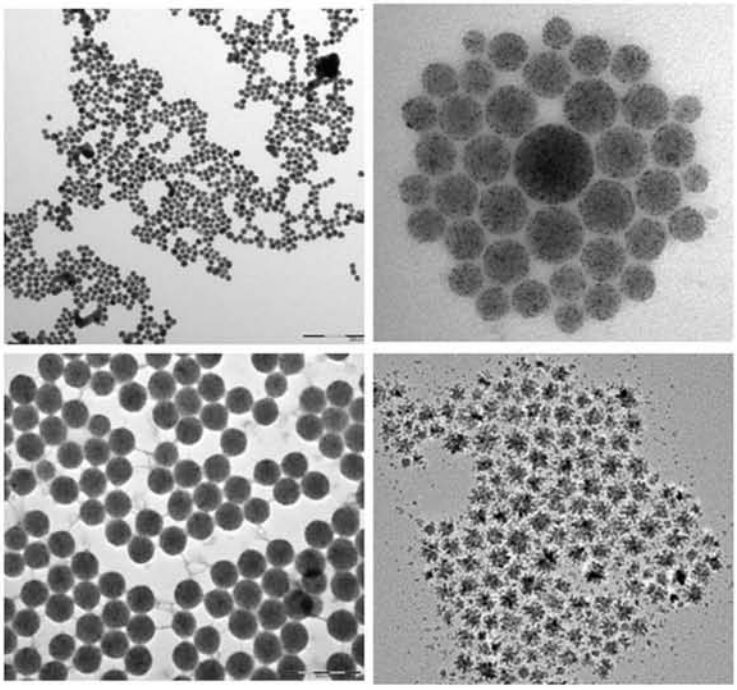
Endor nanoparticles derivatized with biological molecules have novel applications in materials science. Nanoparticles conjugates (with DNA, peptides, organic molecules or proteins) hold great promise both for biological diagnostics, where the nanoparticles can provide unique detection signatures, and for therapy, where



Endor Nanoparticles

ENDOR® NANO TECHNOLOGIES

Targeting Nanotechnologies for the people



Novel Nanomaterials

NanoCosmetic Products

Diagnostic Tools

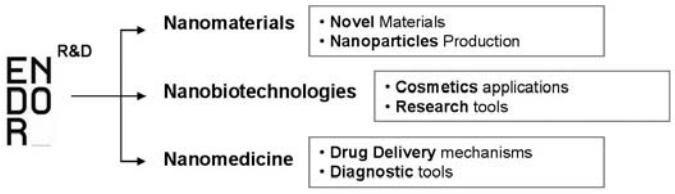
Nanomedicine Drug Delivery Systems

www.endornanotech.com

nanoparticles can improve drug delivery by directly improving pharmacokinetics and biodistribution to increase solubility and efficacy, and thus decrease side effects.
Control over the precise number of molecules per nanoparticles is essential whenever there is a need to quantify, rather than just assess the presence of a particular sequence.

Company Perspective

Endor team is continually expanding our pipeline of R&D projects. These matchless ventures are chosen from three major nano-areas:



Our vision is to select novel nanotechnologies in order to provide smart solutions to the pharmaceutical and medical markets.

Solutex. Nanotex.

Name: Soluciones Nanotecnológicas, S.L. (SOLUTEX Group)
Trademark: Nanotex
Business Identity Code: ESB-99004541
Location:
-Headquarters: Parque Empresarial Omega Ctra. de Barajas, 24 3º-4ª 28109 Alcobendas (Madrid) SPAIN
-U.S.A. Office: 875 N. Michigan Avenue Suite 3162, Chicago, IL 60611
-Production Plants: Polígono Industrial "El Zafranar", P.22 50550 Mallén (Zaragoza) SPAIN
Tel.: (+34) 918060477 / (+1) 312 794-7882
Fax: (+34) 918060605
Web: www.enanotex.com
E-mail: solutex@solutex.es / solutex@solutex.us
Activity: Production of superparamagnetic nanoparticles and ferrofluids, specially for biomedical applications.
History: Established in March 2004, Solutex Group has developed its own technologies (Supercritical Fluid Extraction, SFE, and Supercritical Fluid Chromatography, SFC, with carbon dioxide, CO2) in order to face up the new stage in Food & Beverage, Cosmetics and Pharmacy. Our mission is to promote natural, clean, healthy and profitable ingredients for the market. We supply well-known products with better characteristics and improved performance.
Solutex CEO, Dr. Fernando Moreno, is the founder of the company and also a major shareholder.
Nanotex was recently founded (2007) and centralizes all the previous and current activity of the Solutex Group in the nanotechnology field.

Superparamagnetic nanoparticles for biomedical applications

Nanotex is a young spin-out company founded in October 2007 in order to centralise the capacities of the Solutex® Group in the field of nanotechnology.
Our vision is to be the leading company specialised in the knowledge and in the industrial application of the technologies used to obtain magnetic nanoparticles and ferrofluids, specially in the field of biomedical applications. Currently we are industrially scaling-up a patented technology in order to produce superparamagnetic nanoparticles, specially designed for biomedical applications. Through this proprietary technology we obtain a biocompatible colloid, stable in aqueous solution and at a physiological pH (7.4). Our superparamagnetic nanoparticles (with a size of 5 to 15 nm, with a very narrow size distribution) avoid the recognition by the macrophages and are biocompatible. It is possible to link a monoclonal antibody to their surface in order to target only specific antigens identified through proteomics and/or genomics.
Nanotex additionally works in a Spanish consortium called Oncnosis®, together with pharmaceutical companies and top public hospitals, in order to discover biomarkers to be used in the diagnosis of lung, colo-rectal, melanome and ovaric cancer and use them to develop new diagnosis and therapy tools for these serious diseases.
Nanotex has indentified and is currently working in three main biomedical applications:

1.Magnetic Resonance Imaging (MRI)

MRI provides images of the density distribution of protons or other nuclei by means of appropriate magnetic field gradients and radiofrequency pulse sequences **[1]**. MRI can be used to obtain better images and evidence specific effects.
Natural contrast between normal and diseased tissues can be increased using contrast agents (CA). Today, most of the paramagnetic CA are Gd-based molecules.
The most common superparamagnetic particles used in MRI have a central ferrite core coated with an organic shield (e.g. Dextrane) and have average diameters between 20 to 150 nm.
Until now, no study about the influence of each microscopic parameter on the nuclear relaxivities (i.e. on the CA efficiency) was possible. Nanotex is trying to design and obtain the most suitable particles and colloids for this kind of application.

2.Magnetic Fluid Hyperthermia (MFH)

Hyperthermia means an energy transfer from an AC magnetic field to a material that dissipates this energy in form of heat.
MFH consists of an artificial induction of hyperthermia in cancer cells through application of nanosized magnetic particles. Then the power of an alternative magnetic field is transformed into heat allowing tumor destruction. Cancer cells weaken or die at T lower than healthy cells **[2]** .
Among the various advantages of MFH are:

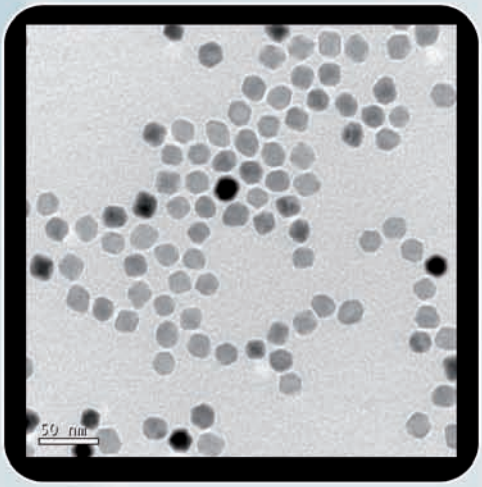
- Good results in local (intratumoral) administration **[3]**
- Good results in organs where nanoparticles naturally

Nanotex®

ナノテックス

Fluids4Life

www.enanotex.com



Superparamagnetic nanoparticles for biomedical applications

バイオメディカル・アプリケーション用超常磁性ナノ粒子

Solutex® Group

Nanoparticles as drug delivery device			
Type	**Diameter (nm)**	**Indications**	**Advantages**
Polimeric nanoparticles	10-1,000	Brain tumors, bone healing, restenosis, diabetes	Sustains localized drugs, therapeutic agent through months
Ceramic particles	<100	Photodynamic therapy, liver theraphy, diabetes	Easy to prepare, hydrosoluble, very stable
Polimeric mycelles	<100	Solid tumors, antifungic	Hydrophobic body, adequate for drugs not soluble in water
Liposomes	50-100	tumors, aids, vaccines	Reduces the toxicity and favours the large durability of the target tissue
Metallic nanoparticles	**<50**	**Cancer**	**Minimun size, large surface area**
Dendrimers	<19	Tumors, aids, treatment of a bacterian infection	Can transport hydrophobic and hydrophilic content

Source: Business Insights

accumulate.

Some of the disadvantages at the current state of the art are:

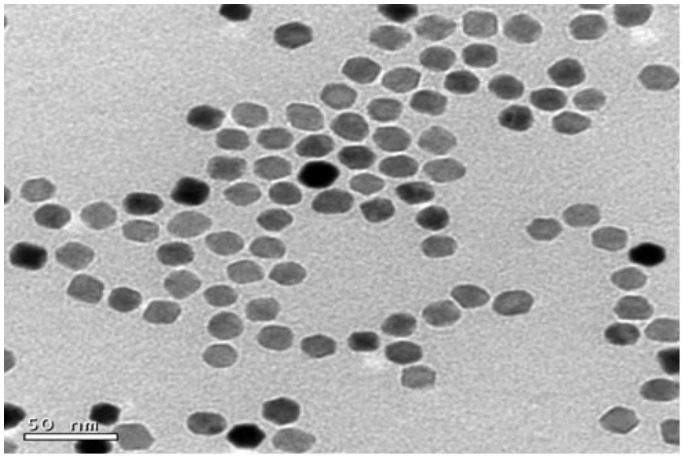
- There is no possibility of natural selective accumulation of nanoparticles in other organs and tumors.
- A very invasive procedure and high concentration is required.

Nanotex produces biocompatible nanomaterials with adequate magnetothermic properties at the range of frequency and magnetic field strength for biomedical applications **[4]** and very low polidispersity.

3.Drug Delivery

There are many different ways to deliver drugs specifically. *Nanotex* develops nanoparticles for drug delivery. Nevertheless, *Nanotex* also works for the Solutex Group in the identification and development of various micro- and nanoencapsulation techniques in order to achieve for bioavailable and stable ingredients for each application (pharma, nutrition, food and beverage, cosmetic,...). *Nanotex* and Solutex develop these technologies together with technology partners and as such is always open and interested in new collaborations.

Despite of its specialisation in biomedical applications Nanotex is however interested and starting to work in other fields, such as the automotive or the aeronautic sectors, where specificity and industrial capability is needed.



References:

[1]a) P.C.Lauterbur, **Nature 242 (1973) 190**; **b)** P.Mansfield, P.G.Morris, *NMR imaging in biomedicine*, **Suppl.2 Adv.Mag.Res., Academic Press (1982)**; **c)**; C.Guy, D.Ffytche in *"An introduction to the principles of medical imaging"*, **Imperial College Press eds. (London, 2000)**

[2] Pankhurst et al. **Journal of Physics D: Applied Physics, 36 (2003) R167-R181**

[3] M. Johannsen et al. **International Journal of Hyperthermia, 21 (7), 637, 2005**

[4] Atkinson et al. **IEEE Trans. Biomed. Eng., BME 31 (1984) 70-5.**

Grupo Antolin: there is a different way to create the interior of a car

César Merino - Grupo Antolin
Responsible for Carbon Nanofibres
Innovation and Marketing Department

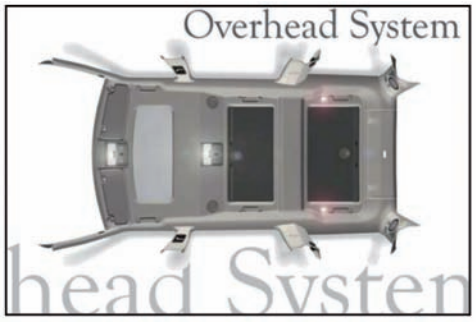
Grupo Antolin is a Spanish multinational leader in the design, development and manufacturing of automotive interior components. The company focuses its strategy on the following three main func-

Grupo Antolin Headquarters in Burgos (Spain)

tions: overhead, door and seat.

Overhead System

Ever since its beginnings, the Overhead System has identified Grupo Antolin on a global scale as a pioneer in the research and development of technologies. The domain of modular solutions places Grupo Antolin as world-wide leader in this function. In order to reinforce this position, Grupo Antolin has integrated new and complex functionalities into headliner substrate to create the current modular systems adding lighting functions, solar protection devices, sun visors,…



Grupo Antolin Modular headliner

Door Function

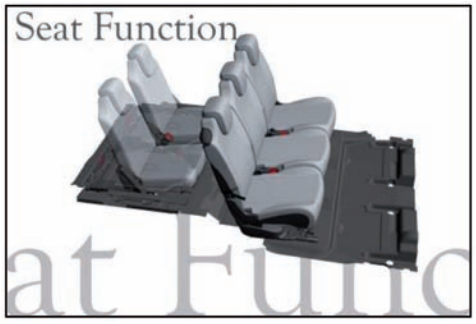
Its expertise in the fields of interior trim and mechanisms allows Grupo Antolin to offer a wide range of modular solutions that place the company in the first positions of the global ranking.

Grupo Antolin DTM Door Trim Module®

The innovative DTM Door Trim Module® is the finest example of door integration at a global level and one of the biggest technological bids for the company.

Seat Function

Grupo Antolin is the technological leader in the development and manufacture of complete lightweight seat systems, featuring an integrated three-point integrated safety belt.



Grupo Antolin Stow-into-floor seats

With total sales higher than 1.900 million Euros in 2006, presence in 23 countries through 81 plants and 20 Technical-Commercial offices, Grupo Antolin employs more than 10.000 people who work with the objective to reach the full satisfaction of the customers.

Innovation: the constant driving force behind Grupo Antolin's commitment to the future

The identity axle of Grupo Antolin is its R&D&i capacity with an historical investment of 5% over sales. This strategy allows the Group to offer multi-technological products, thanks to the knowledge of different areas: materials, advanced simulation techniques, electronics, industrial processes, safety, acoustics and vibrations... and its highly skilled Human Resources.

Innovation, as part of the R&D&i capacity, is the company's response to a world in constant change, and the driving force behind the rapid development of Grupo Antolin. Innovation means challenging what already exists, seeking constant progress through the generation of new ideas with which to achieve a clear and differentiating advantage. This needs to be applied to the whole product cycle, from the Competitive Intelligence phase through to delivery of the mass.

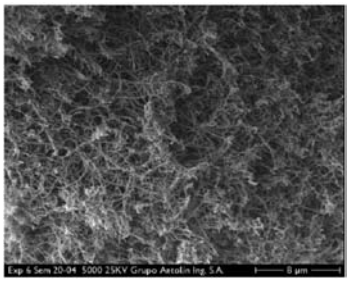
When identifying a business opportunity the innovation model of Grupo Antolin starts, the information providing by its customers and the final users as well as Grupo Antolin knowledge are the main sources to set the needs of the market. Then, the technological development is launched analysing its feasibility in order to search the potential clients to join this process.

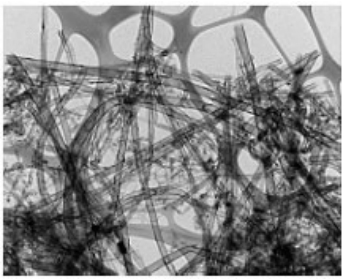
Grupo Antolin Nanofibres: the first European Carbon Nanofibres

The Group innovates in new technologies or in new ways to apply the current ones, carbon nanofibres are a good example of this kind of innovation.

Grupo Antolin Carbon Nanofibres (GANFs) are s-VGCF, (submicron Vapour Grown Carbon Fibres) with very small diameter, excellent aspect ratio and highly graphitic structure (graphitization degree about 70%). They are characterised by outstanding mechanical and transport properties (exceptionally high electric and thermal conductivity).

Owing to their very small diameter and high aspect ratio, GANFs are able of making up a very effective conductive network in polymer or other matrices at very low loading content. Furthermore, conductive parts fabricated with GANFs added thermoplastic compounds present smoother surface finish than parts fabricated with alternative conductive additives such as carbon black or carbon fibres.





Other properties that set GANFs as an extraordinary product to be used in several industrial applications are:

- Low coefficient of thermal expansion
- Recyclable composite parts
- Anticorrosive properties
- Tribological properties
- High specific surface area
- Mechanical properties improvement

High aspect ratio **Carbon Nanofibres** and their derived products with outstanding properties.

Ctra. Madrid Irún, Km. 244,8 - E-09007 Burgos - Spain - Tel.: +34 - 947 47 77 00 - mail: nfibrascarbono.ga@grupoantolin.com

www.grupoantolin.com

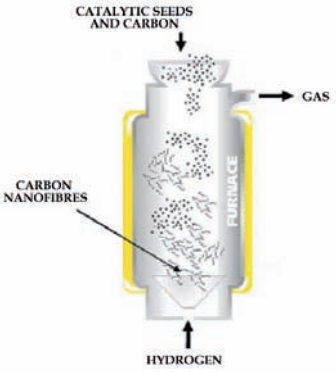
Comparison between carbon fibres and GANFs

Standard continuous carbon fibres are obtained through different thermal treatments of precursor fibre material. The precursor material is typically a polymer yarn such a rayon or polyacrylonitrile (PAN) or can also be melted and spun pitch.

GANFs are continuously produced in a single step from the thermal decomposition of hydrocarbons in presence of metallic catalyst particles by the floating catalyst technique at about 1100ºC.

Applications of Grupo Antolin Carbon Nanofibres are:

- Aerospace and Aeronautics
- Automotive
- Energy
- Electronics
- Textile
- Chemistry



Grupo Antolin supplies carbon nanofibres in powder form, in thermoplastics masterbatch, and in suspensions or dispersions in different solvents, paints and thermoset resins. Grupo Antolin has also developed nanocomposite ceramics with carbon nanofibres content presenting outstanding mechanical properties and electrical conductivity, besides extremely low coefficient of thermal expansion.

Based on carbon nanofibres Grupo Antolin has obtained materials for improving the performance of supercapacitors and Li-ion batteries electrodes, and for attaining out standing performance bipolar plates for fuel cells.

NANOGAP
SUBnmPOWDERS

Nanogap is a spin-off from the USC investigation group 'NANOMAG', with more than 250 publications. This cutting edge nanoscience leads to our nanotechnology, which includes a novel technology to produce subnanoparticles (AQCs).

Nanogap's history

NanoGap is an innovative company based on the research carried out by Professors M. A. López-Quintela and J. Rivas (University of Santiago de Compostela), experts on the nanotechnology field with more than 250 publications on high impact journals and several patents (J. Rivas is the director of the next Iberian International Nanotechnology Center).

NanoGap does not only produces novel and unique nanoparticles (AQCs), but also offers a continuous advising to our clients on the specific uses and applications of any of our products, contributing to an added valued on the products.

Physicist and Chemistry Professors and Doctors in several matters conform Nanomag Research Group. Thanks to our collaboration with them, Nanogap offers personalized solutions not only in nanoparticles but also services and related I+D. Our expertise in nanoparticle production and the reproducibility attained with our production methods is a guarantee to all of our customers.

Nanogap scientific advisory board

Prof. Dr. M. Arturo Lopez Quintela

Is Full Professor of Physical Chemistry of the USC (Spain) from 1990 and Co-Editor of the Journal of Colloid and Interface Science (Elsevier) since 2005. He has more than 230 publications in international journals and is the owner of several patents. He received the Spanish Solvay Price in Chemistry in 1998 and shares with Prof. J. Rivas the 1998 Burdinola Price in New Chemistry Nanotechnologies.

Prof. Dr. José Rivas

Is Full Professor of Applied Physics of the USC (Spain) from 1982 and director of the recent created Spanish-Portuguese International Nanotechnology Laboratory (INL, Braga, Portugal). He has more than 250 publications in international journals and is the owner of several patents. He is a member of the EMRC Steering Committee for the Scientific Forward Look Nanomedicine Strategic Plan (2002-2006) and shares with Prof. López-Quintela the 1998 Burdinola Price in New Chemistry Nanotechnologies.

Products

Metallic and Oxide Nanoparticles

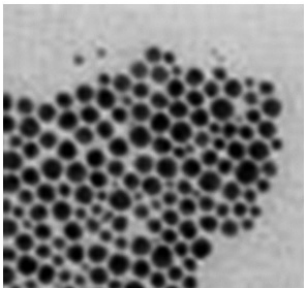
Nanogap produces metallic nanoparticles as Au, Ag; magnetic nanoparticles as Iron Oxides besides other kind of magnetic and semiconductor nanoparticles.

Going down from the nanometer to the Amstrong range, matter gets astonishing new properties.

Nanogap leads the research and industrial production of these new particles, the Atomic Quantum Clusters. We are currently serving Au, Ag, Pt and Cu clusters.

AQCs are stable groups of 2 to 100 atoms. This range of sizes gives matter brand new properties that can be used in multiple industry applications.

Au



Very monodisperse Au nanoparticles with different coatings (PVP as standard). Customizable sizes below 100nm. They can be served in organic solvents or water.

Applications:

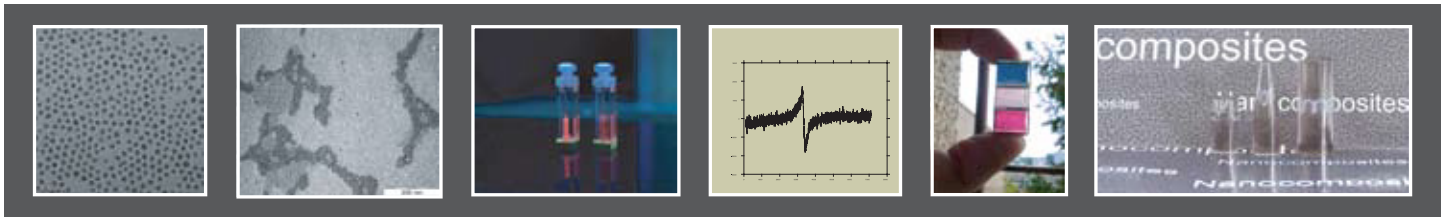
BioChemical fields, Biosensors, Drug delivery, Electrochemical sensors, Electronic components, Microelectronic devices, Photocatalysts, Photonic scattering, Polarising filters.

Ag

Very monodisperse Ag nanoparticles with different coatings (PVP as standard). Customizable sizes below 100nm. They can be served in organic sol-

NANOGAP
SUBnmPOWDERS

Are you looking for Nanoparticles?



NANOGAP is a developer of a totally innovative technology to produce **nanomaterials at the atomic level** with new and improved properties

Metallic Nanoparticles
Magnetic Nanoparticles
Atomic Quantum Clusters (AQCs)

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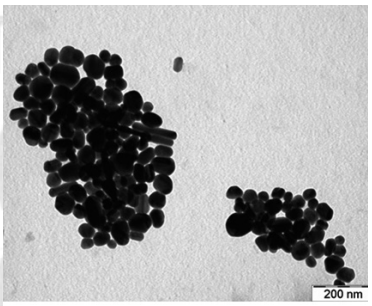
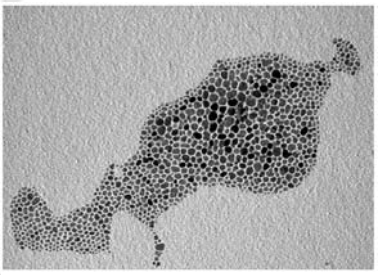
www.nanogap.es

Nanogap is a spin-off from the USC investigation group 'NANOMAG', with more than 250 publications. This cutting edge nanoscience leads to our nanotechnology, which includes a novel technology to produce subnanoparticles (AQCs)

vents or water.
Applications:
Components for integrated circuits, Conductive coatings, Conductive inks, Conductive pastes, EMI/RFI shielding, High thermal conductivity materials, Optical filters, Optical devices, Photonic crystals, Silver colloids.



Iron Oxides



Very monodisperse magnetite and maghemite nanoparticles coated with oleic acid. They can be served in organic solvents or water
Applications:
Magnetic cell separation, Magnetic fluids, Pigments, DNA sequencing,...

Main strategy

Nanogap customizes all of its products depending on the needs of the customer. We are also offering:

- Synthesis of other kind of nanoparticles and its functionalization “à la carte”
- Dispersion of the particles in the final composite or material
- R+D services

We have expertise mixing the nanoparticles in our customer’s final materials. Nanogap disperses the nanoparticles in any solvent / precursor material you may have. Our products are ready to use: our customers treat the nano-additivated material as any standard material.
Nanogap can even produce the nanoparticles inside the final material

Reliability

Nanogap has recently won Spanish Ministry of Industry’s ENISA award as the most innovative new company of Spain. We work with several hospitals and research institutes testing the characteristics of the nanomaterials we are producing. We take very seriously the safety and quality of all of our products.
Nanogap is able to serve industry and in March 2008 will open its new factory able to produce kg/day.
Nanogap is also part of:

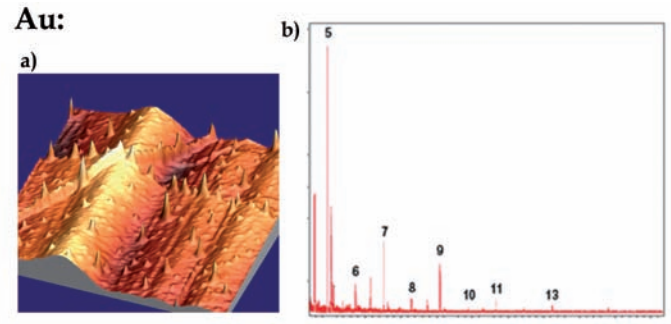
- ENTA as member and scientific advisor
- NIA as member
- Nanocentral as member
- ISO/CEN as member and tech. experts in several working groups

R+D

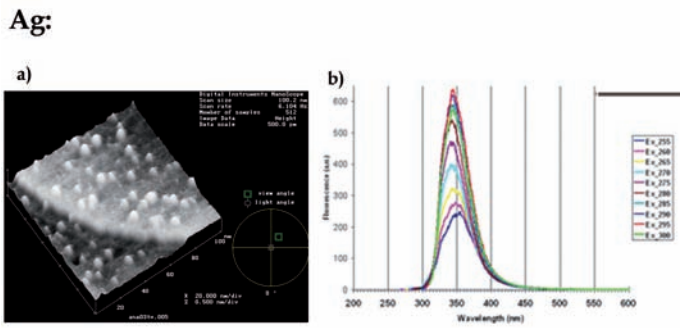
Nanogap is part of several research projects, for instance FP6 Fluoromag. This project is aimed to develop a real time confocal microscope able to detect a single virus in a human being. Our patented unique technology is able to produce biocompatible Quantum Dots used as biomarkers in the kit.

More

If you want to know more about us, don’t hesitate and contact our business manager Luis M. Alonso (**lm.alonso@nanogap.es**)



a) *Cluster in the range from 2 to 100 atoms can be provided. Clusters display interesting catalitic, fluorescent and magnetic properties.* ***b)*** *MALDImass spectra of gold atomic quantum cluster showing preference of odd number of atoms.*



a) *Cluster in the range from 2 to 100 atoms can be provided. Clusters display interesting catalitic, fluorescent and magnetic properties.* ***b)*** *Excitation spectra of Silver clusters showing an example of the novel properties of the novel fluorescent properties of silver (and gold) AQCs .*

acciona
I+D+i

COMPANY DESCRIPTION

ACCIONA Infrastructures is a leading European construction company developing and managing buildings and civil infrastructures under the sustainability principles. It has an international presence in more than 30 countries and its total turnover in 2006 was 3.6 billion Euros, employing 14.000 people. It is part of ACCIONA Group, whose business lines are Construction, Real State, Urban & Environmental Services, Renewable Energy, Water and Logistic & Transport Services.
The development and early use of advanced composite materials for construction applications, such us sustainable buildings and civil infrastructures (particularly in bridges), strongly contributes to the core strategy of ACCIONA Infrastructures.

TECHNOLOGICAL CENTER

The ACCIONA´s RDI Technological Centre of Madrid (TCM) is composed by 120 high qualified researchers: civil, energy, industrial, chemists, environmental, telecom and electronic engineer as well as architects, physicists, biologists, etc.

***Figure 1**: Nanotechnology Center. ACCIONA. Madrid*

The advanced materials group research is focus on nanotechnologies, PCMs, aerogels, synthetic polymers, foams and gypsum, as well as optimization of the composite whole life-cycle and industrialization of the construction process for the design of lighter and strengthens structures. TCM owns laboratories of nanotechnology and advanced materials, RES integration, ICTs, chemistry analysis, and workshops for prototyping components.

ACCIONA Infrastructures is an active member of some European and Spanish TPs and initiatives:

- European Technology Platform on Advanced Engineering Material and Technologies (EUMAT).
- European Sustainable Chemistry Platform (SUSCHEM).
- European Construction TP (ECTP), being part of its High Level and Support Group, leading the Focus Area Cities and Buildings and several WGs in other Focus Areas such as Materials.
- Member of the core group of the Smart Energy Home (SEH) Initiative from SUSCHEM.
- Co-leader of Joint Technology Initiative on Energy Efficient Buildings (JTI E2B), from ECTP.
- Member of EUROACE, ECCREDI, ENCORD and FIEC.
- Member of National Technological Platforms construction/materials/energy related.
- Standardization Committee EuroCode-10 for composite material and EuroCode-11.

TECHNOLOGICAL AREAS

Ecoefficiency and comfortability. Achieve high level of Energy Efficiency in Buildings through:

- Bioclimatic Architecture
- Renewable Energies Building Integration: Solar thermal, Solar photovoltaic, Biomass, Wind turbines
- Increase the performance of conventional HVAC installations

Composite materials. Application of composite materials on the construction industry: design of new structures and reinforcement of existing structures in conventional materials.

Optimization of the whole life-cycle: taylor-made design, industrialization of the construction process, environmental-friendly pursuing a sustainable and cost-efficient development.

Transport. Maintenance and reparation of ships. Intelligent transport.

Geotechnics. Design, ejecution and control of the first embarkment built in Europe neumatics out of use and triturate.

Development of an specific chemical product for ground stabilitation.

Advanced materials.This area involves the development of new and improved materials for buildings and civil infrastructures. The main research areas are:

- Nanotechnologies
- Phase change materials
- Aerogels
- Hydrogen technologies
- Synthetic polymers
- Foams
- Gypsum, etc.

Concrete. Development of new technologies for the improvement of concrete properties. Thus, construction times are reduced and material resistance is increased.

- Ultra-high resistance concrete
- Light-weight concrete
- Concrete maturity
- Self-consolidated concrete

Robotic. Sensors, drivers, interfaces, data transmission, location, motors, movility,…

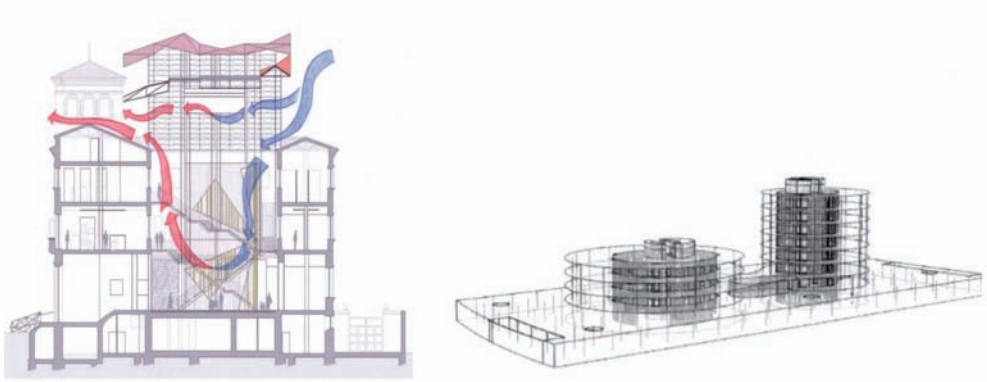


***Figure 2**: Ecoefficiency design*

NANOTECHNOLOGY

Nanocomposites based on carbon nanotubes for the building industry.

Development of reinforced materials based on Carbon Nanotubes and Nanofibers reinforcing a polymeric matrix for construction applications.

Specific applications of this development:

- Manufacturing of Specific Polymer-Nanoparticle Materials

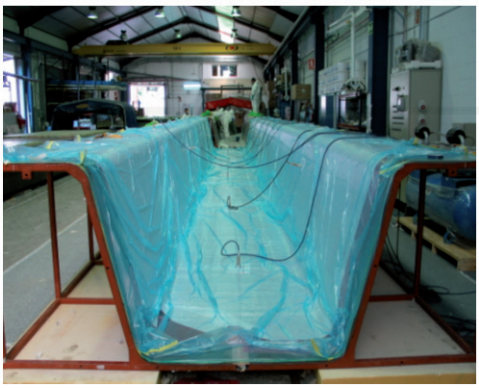


***Figure 3**: Fire test and **Figure 4**: Construction process*

reinforced with fibers. The most important application of these new materials depends on nanoparticles, of which electrical and mechanical properties convert them into structural sensors.

- Applications for Electromagnetic Shieldings and protection against corrosion.

***Figure 5**: ACCIONA's passenger ship.*

Improvement of adhesive systems with nanoparticles. The employment of nanotechnology in adhesive systems offers lot of opportunities to improve the join technologies. The main objective consist on improving the adhesive performances of thermosetting polymeric adhesive using two king of nanoparticles, which are carbon nanotubes and nanoclays.

Thanks to their nanostructures, the mechanical properties and chemical stability of these compounds are much higher than bulk materials employed adhesion. However, processes are not simple and must be adapted to the adhesive properties and chemical nature

Heat proof paints. The research of energy savings is one of the highlights of buildings environment. According to albeldo change of the wall-facing materials buildings there is a variation in indoor temperature. The heat-insulation performance of wall-facing materials has a vital effect on creating comfortable. Under the same conditions, the wall-facing materials with high albeldo can reflect incident solar radiation and hold back heat into buildings effectively in summer, and they maintain a higher indoor temperature for preventing heat dissipating outside in winter.

Conductive polymers. The used method to achieve electrical properties in polymers consists of adding metallic powders, such as Ni or Ag, when the polymer is in the molten state. The metallic powders must have an appropriate scattering, which is achieved with ultrasonic waves. Otherwise, instead of metallic powders, the doping process can be made with inorganic fillers, such as CNT or functionalized NS.

The conductive polymers can be used as heat resistors applying over them an electrical current and could replace the copper wires if the amount of inorganic fillers fits in an optimum range with their scattering.

Modification on the rheological behaviour of polymers with nanosepiolite.

The modification of the rheological properties on the polymers is possible by adding organosepiolite within the epoxy resin. In this case, the new polymer has the same viscosity as the raw one applying it at high shear forces, but there is an exceptional increase at low shear forces applicated.

With this new material we solve the drip of the resin during the impregnation process.

Aerogel. Aerogels have been recognized as excellent insulating materials for more than 70 years, providing two to eight times lower thermal conductivity than conventional insulation materials such as mineral wool or calcium silicate. That the significant insulation improvement with aerogels arises from their structure. They have nanometer-scale pores, less than 1/10,000th the width of a human hair, which significantly reduces the mean free path of gas molecules traveling through the insulation pad. This translates to greatly reduced energy and mass transfer, making for excellent insulation.

Phase change materials microncapsulates. From new materials area we are focusing nowadays in research and development of new additives for construction, aimed towards building energy efficiency and energy management.

Physical property involved on these new additives and materials, consist on phase change, form solid to liquid, in this case. When phase change is produced, large amounts of heat are absorbed by the material, until all the

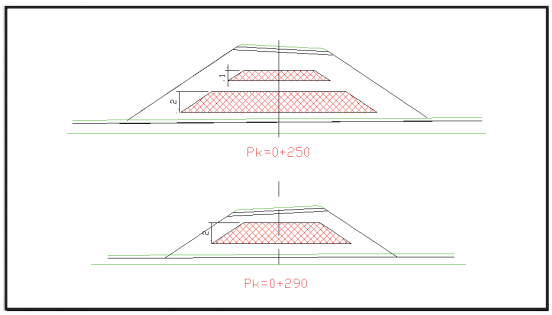


***Figure 6**: Embankment. Bacteria*

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Pioneers in development and sustainability

***Figure 7**: Concrete test. Temperature sensor*

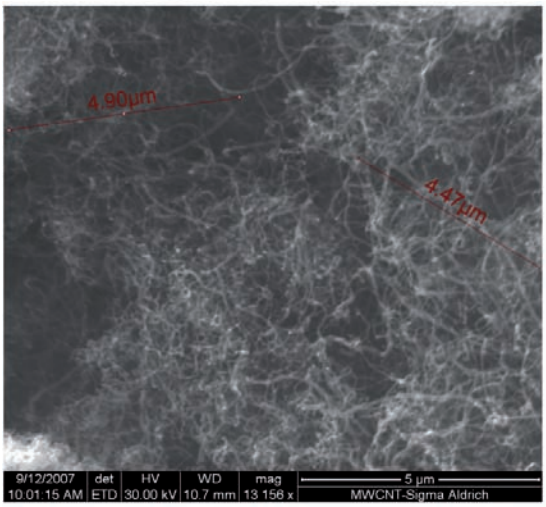

***Figure 8**: Carbon nanotubes*

material has changed it physical state; this amount of heat absorbed stays stored as latent energy. This is the physical "trick" which allow us to store "extra" amounts of heat inside construction materials. With this physical property of heat absorption heat storage is gained inside construction materials (walls, ceilings, floors,…). This allow us to refrigerate insulated areas without external energy consumptions. In this way we work with "active materials" which start working when desired temperature is reached. By means of this "smart management" of temperature, construction materials can be modified in order to achieve perfect comfort conditions.

With energy simulation software we are working on getting the optimum amount of phase change material needed on each project, depending on several climate factors like radiation, altitude, latitude, orientation and type of used wall. On this way, phase change materials are expected to be incorporated to new buildings as complement of actual refrigerating systems, working with them towards more energy sustainable buildings.

Nanotechnology in cement materials. To develop and obtain innovative materials oriented nanotechnologically. The principal objective is a study of nanostructured cement-based materials to combine all the properties of sepiolite and carbon nanofibers in order to improve physical and chemical parameters of cement materials and to widen a scale of their application.

One works on metal incorporation into a cement matrix in order to solve an agglomeration problem which they produce with a help of sepiolite modifications by metal oxides as TiO2, ZnO, CuO, etc.

These additions and additives allow introducing into the cement-based materials completely new characteristics as biocide, sliding, conductive, tribologic as well as high compression and tensile resistance and electromagnetic shielding properties.

Likewise, one controls an influence of the new additions on a mechanical resistance development, volume stability and durability of a new nanocomposite as well as on

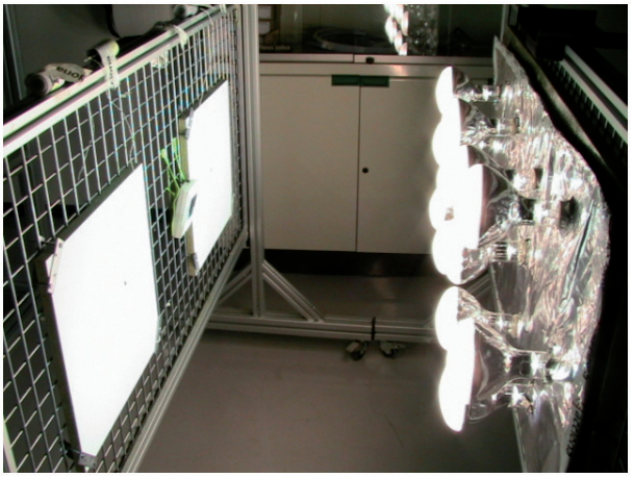

***Figure 10**: Solar simulator*

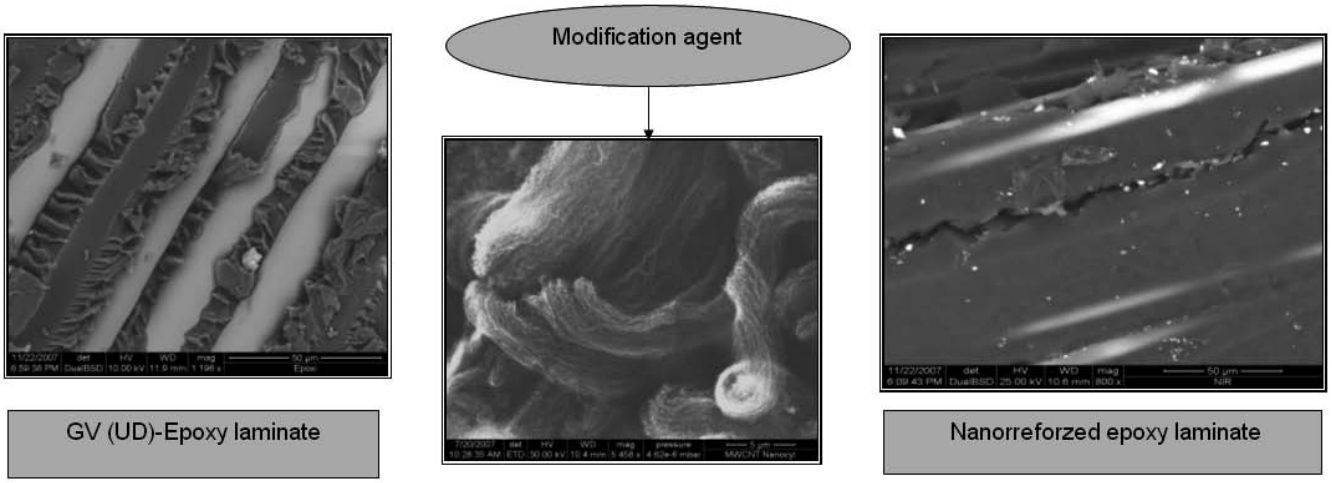

***Figure 9**: Polymer nanorreforced process.*

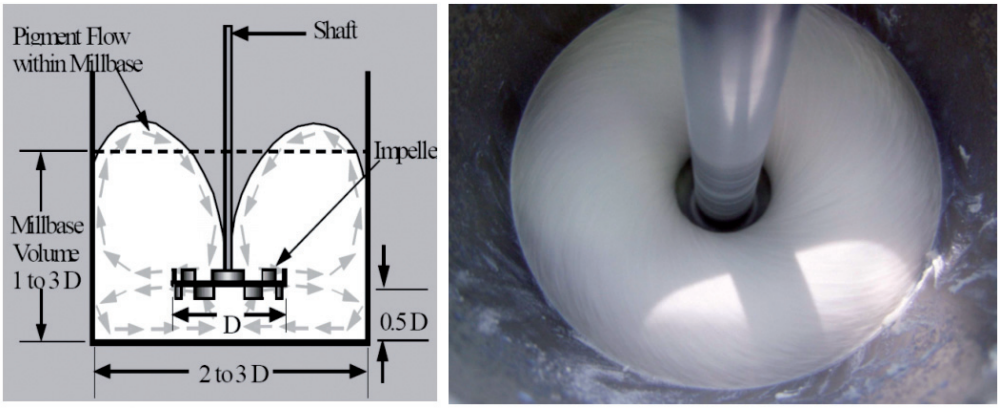

***Figure 11**: Optimal rate of parameters for a good dispersion. Doughnut effect.*

Portland cement hydration process to confirm its structure and chemical composition of the nanocomposite at the nano and microscale.

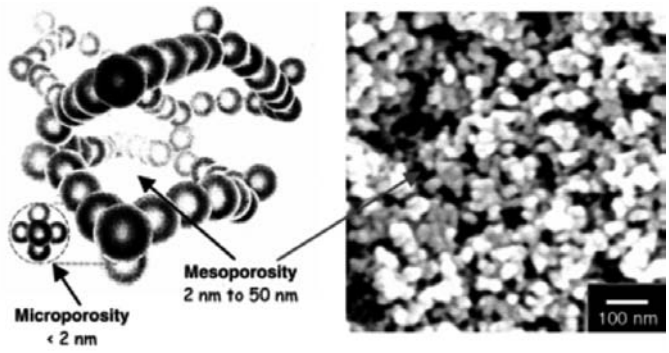

***Figure 12:** Aerogel structure.*

***Figure 13**: SEM image. Microencapsulate*

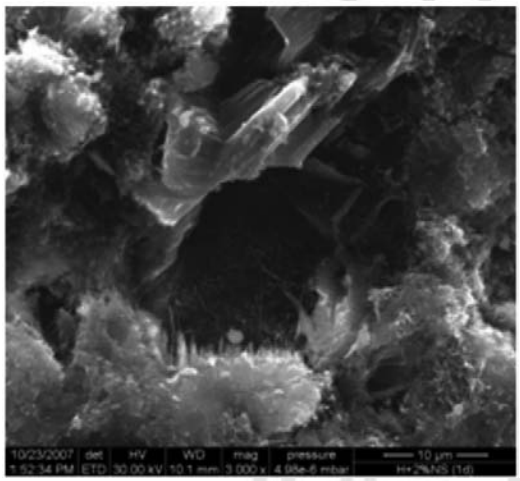

***Figure 14**: Cement hydration products and sepiolite*

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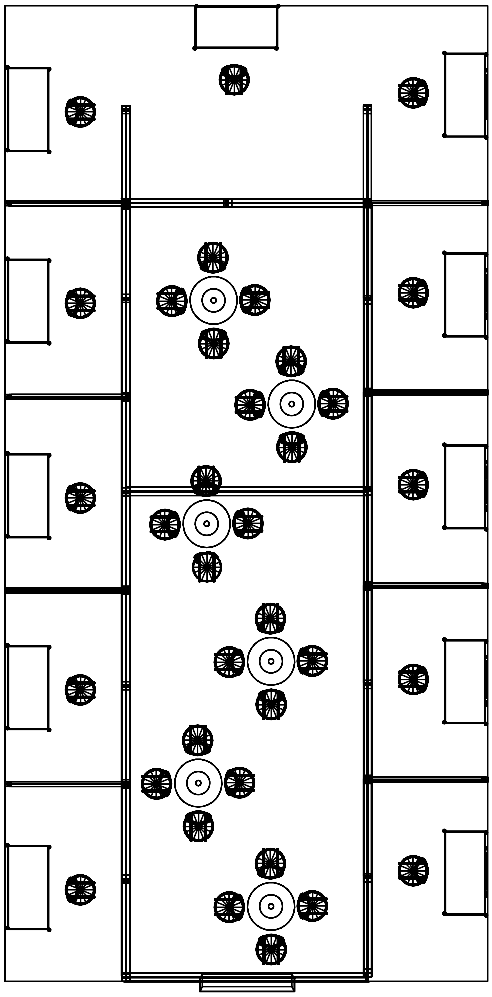

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