

Una manera de hacer Europa



BUENAS PRÁCTICAS

Actuaciones Cofinanciadas

"Controlled environment laboratories for Nanofabrication processes - CENanoTech"
Catalan Institute of Nanoscience and Nanotechnology (ICN2).

Programa Operativo de Catalunya

Año 2018

Fondo Europeo de Desarrollo Regional

Submitted as Good Practice the project: "Controlled environment laboratories for Nanofabrication processes - CENanoTech" of the Catalan Institute of Nanoscience and Nanotechnology (ICN2).

The CENanoTech project consists of equipping the Catalan Institute of Nanoscience and Nanotechnology with controlled environment laboratories that allow the center to develop key processes for the experimentation and development of novel applications and devices in the field of nanotechnology. The precise manufacture of nanoscale devices and the rigorous study of the interactions of living cells with a new generation of nanomaterials are fundamental for an institute such as this one that aims to position itself as a benchmark in the field of international R&D in nanotechnology, develop marketable leading technologies and train young scientists in innovative experimental techniques.

Currently, the Institute building has only one small controlled environment laboratory and therefore some equipment works in non-optimal environments and many processes have to be done in non- the Catalan Institute of Nanoscience and Nanotechnology facilities. Each transportation of samples from one facility to another or their treatment outside a controlled environment negatively affects their quality, with very negative consequences for experimental results, to the point of jeopardizing the achievement of the objectives of important projects.

The proposal presented focuses on enabling three existing spaces within the building, two of which are currently out of use, adapting two of them for controlled environments of temperature, humidity and cleanliness where to place a series of nanofabrication equipment, while in the other establish a level 2 biosecurity zone that allows the culture of biological cells in contact with nanostructured materials. The proposal includes the qualification and adaptation of the spaces, the environment control machinery, access controls and key scientific equipment to start the activity in the new spaces, complement the equipment that Institute already has and complete the chain of essential processes in both laboratories.

Thanks to this action, the Institute is getting to reinforce and complement the technological offer already present in the Nanocluster of Bellaterra (<http://www.bnc-b.net/>), offering new possibilities of use and exploitation of leading equipment in this field and exploring new methodologies to satisfy demands that are difficult to execute in other facilities of this type.

The total eligible cost of this action amounts to € 1,327,185 assuming a final FEDER grant of € 663,593. Moreover, the project has allowed the creation of 2 new jobs positions for researchers in addition to the 75 researchers already working in the center.

This operation is presented as Good Practice because it meets the following criteria:

1. High level of dissemination among beneficiaries, potential beneficiaries and the general public

The CENanoTech project has been conveniently disseminated among the beneficiaries, potential beneficiaries and the general public thanks to different communication actions that focused on the dissemination of the project on the Internet and its presentation at specialized conferences. It also took advantage of the dynamism of the institute in the dissemination of news related to the research carried out in the center either via its website or social networks.

- Extensive dissemination on the institute's website (<https://icn2.cat/>)

- [News where explicit mention is made of the recognition of ERDF for granting the project.](#)
- [News where the project is mentioned as a facilitator of various infrastructures.](#)

NEWS

Tuesday, 04 July 2017

New facilities and equipment at the ICN2

The ICN2 is currently implementing a project to develop a set of "Controlled Environment Nanotechnology Fabrication and Testing Facilities". The goal of CENanoTech is to transform two areas of the ICN2 building into controlled-atmosphere laboratories with state-of-the-art equipment.



The new Nanofabrication Laboratory, complete with Raman microscope, and ICP-RIE and UV photolithography systems, will allow ICN2 researchers to include non conventional materials like organic materials and flexible substrates into the process line. Meanwhile the new Bio Laboratory will be used for advanced cell culture and biological testing, enabling the manipulation of biological samples and the study of how they interact with nanostructured materials like nanoparticles and biomedical "nanodevices".

Being able to precisely manufacture devices at the nanoscale and study the interactions between living cells and the latest nanomaterials is fundamental to a research institute like the ICN2. Crucially, these new laboratories will allow the institute to carry out advanced experimentation and further develop innovative applications and devices in-house. Not only will this strengthen the institute's global position within the field of nanotechnology and catalyse the development of marketable technologies, but it also makes the institute more attractive as a place of learning, allowing it to train its young scientists in state-of-the-art techniques.

The CENanoTech project (ref.: 2015 FEDER/S-16) is funded through the call for the development of R&D infrastructures launched by the Regional Ministry of Economy and Knowledge, of the Generalitat de Catalunya, with funding received from the European Regional Development Fund. The project has also been co-funded by the Severo Ochoa Programme granted by the Spanish Ministry of Economy, Industry and Competitiveness.

MISSION AND VISION

The Nanofabrication facility is a cross-group, general user facility, designed to support the ICN2 research effort. The facility is open to all trained personnel on a recharge basis, including ICN2 as well as external personnel. It is our mission to provide a state-of-the-art facility for advanced device fabrication at the micro- and nano-scale.

In addition to providing essential micro and nanofabrication capabilities for mainstream research on electronics, optoelectronics and 2D materials and devices, the facility is intended to facilitate the pursuit of research in emerging, interdisciplinary, and rapidly growing fields such as biomedical and biomimetic lab-on-a-chip devices, heterogeneous integrated circuits, photonics and photonic devices and nanoscale science and technology.

The Nanofabrication facility aims to deliver outcomes that will have real impact for users, by ensuring that it is easy to access, right in how it applies engineering expertise to respond quickly and accurately, and always seeking opportunities to enhance the quality of services that are available.

FACILITY

The Nanofabrication Facility Lab is a 100m² cleanroom-type laboratory that offers equipment for the fabrication and characterization of micro- and nanodevices and structures. It is a specially designed and constructed room in which the air supply, air distribution, air filtration, materials of construction and operating procedures are regulated to control airborne particle concentrations to meet appropriate cleanliness levels. Our facility is divided as ISO Class 6 and 7 which means that there are at most 1,000 or 10,000 particles ≥ 0.1 µm per m³ respectively.

The facility is segmented in three dedicated rooms: ISO-6 room for Lithography processes and two ISO-7 rooms for etching and deposition processes.



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The ICN2 Nanofabrication facility has received funds from the CENanoTech project. In turn, the CENanoTech project (ref.: 2015 FEDER/S-16) is funded through the call for the development of R&D infrastructures launched by the Regional Ministry of Economy and Knowledge, of the Generalitat de Catalunya, with funding received from the European Regional Development Fund. The project has also been co-funded by the Severo Ochoa Programme granted by the Spanish Ministry of Economy, Industry and Competitiveness.

- [News announcing the first users in one of the laboratories related to this action.](#)

Last October 2017 work began on the ICN2's very own cleanroom-type facility for the fabrication and testing of nanodevices under environmentally controlled conditions. Funded by the ERDF-funded project [CENano Tech](#) and the institute's [Severo Ochoa](#) award, the aim of the [Nanofabrication Facility](#) is to provide internal and external research scientists an experimental space for prototype development and testing. The facility will be fully installed by the end of the year, but this week saw the first users suit up and try out the new equipment.

Primarily aimed at research groups, the facility follows the philosophy of the ICN2's [Research Support](#) Division as a whole: to serve as a meeting point for scientists from different disciplines and a catalyst for the mutual sharing and exchange of knowledge, approaches and processes. With work led by Severo Ochoa research engineer, Dr [Raúl Pérez Rodríguez](#), this facility constitutes a significant addition to the ICN2 scientific infrastructure, especially in light of its renewed goals to bring more of its [technologies closer to market](#).

The CENanoTech project (ref.: 2015 FEDER/S-16) was funded through the call for the development of R&D infrastructures launched by the Regional Ministry of Economy and Knowledge of the Generalitat de Catalunya using funding received from the European Regional Development Fund. Funds were also allocated from the ICN2 Severo Ochoa Programme 2014-2018 granted by the Spanish Ministry of Economy, Industry and Competitiveness.

- **Name plate on the doors of the different laboratories that have benefited from this action.**



Door of controlled environment laboratory for nanofabrication processes (large room)

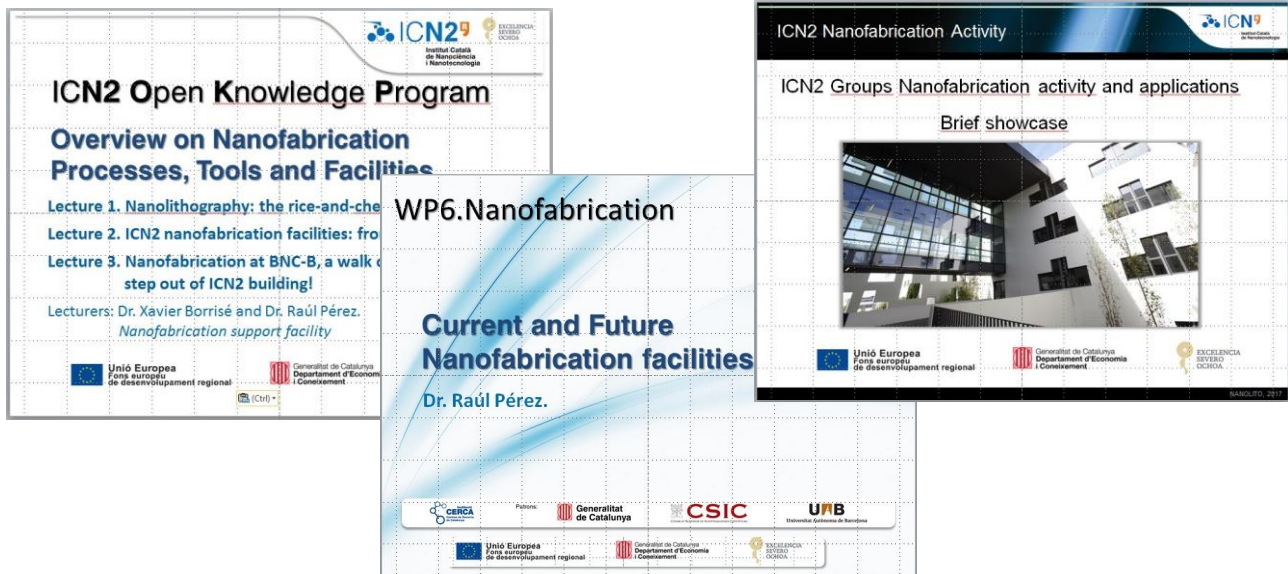


Door of controlled environment laboratory for nanofabrication processes (small room)



Door of controlled environment laboratory for nanofabrication processes (cell culture room and biological tests)

- **Conferences in different audiences** in which the project was mentioned. The ERDF logo was included in the presentations of the talks: Open Knowledge Program ICN2 - Network Meeting NANOLITO Spain, Institute of Nanoscience of Aragon (INA), Zaragoza - III Severo Ochoa Workshop ICN2.



2. Inclusion of innovative elements

The highly innovative nature of the new infrastructure obtained with the help of the CENanoTech project is that it will allow the center, among other things, to combine experimentation of nanodevices in biological applications with all the guarantees of safety and reliability in the results. Thus, the CENanoTech project is perfectly framed in the strategy that has led the institute to obtain the recognition as Severo Ochoa Center of excellence: betting on a leading and singular infrastructure in its multidisciplinary nature that allows developing an innovative science of very high level not possible in other more specialized centers.

It is worth mentioning some very innovative projects that benefit from the infrastructure associated with this action, such as the Graphene Flagship (design, manufacture and evaluate biomedical devices based on graphene); POCKET (development of low cost test for the immediate diagnosis for the detection of tuberculosis); and BRAAVOO (development of low cost test to detect pollutants in water).

3. Linkage between results obtained from the supported actions and the objectives established

In the course of 2018, the adaptation of the environments dedicated to nanofabrication processes was completed and two Nanofabrication laboratories, a Cell Culture and Biological Tests laboratory were enabled and the purchase of scientific equipment was made, a key element to make these infrastructures completely functional and operative.

The habilitation of these spaces and the installation and commissioning of the laboratory equipment has meant a great qualitative leap in the experimental activity of the center. With this action, experimental activities that had previously been carried out in different physical places, including

places outside the center's premises, have been integrated into these spaces. Therefore, achieving the objectives initially planned.

4. Contributing to resolving a regional problem or weakness

Investments in infrastructure are currently focused on developing regional or international networks that facilitate an increase in the internationalization of researchers and the promotion of international collaborations for their mobility. This represents a much more effective use of the economic resources dedicated to scientific equipment, reducing the duplication and underutilization of expensive facilities while increasing the interaction of researchers and fostering new links and collaborations.

Thanks to the action presented, the institute will become a more attractive partner in this type of networks, with the implicit advantages of greater use of its scientific facilities. A greater internationalization and the creation of networks will lead to new international collaborations and a higher participation in consortiums of international projects. The center's researchers also benefit through reciprocally funded access to unique facilities in other countries.

5. High degree of coverage of the target population

The biological culture room, conditioned in the framework of the presented project, gives the institute the capacity to carry out level 2 biosecurity experiments, in particular the study of the interactions of new nanomaterials and nanodevices with cell lines, crucial studies for the development of biomedical technologies that clearly have a very important impact on Catalan society in general.

An important part of the activities that can be carried out thanks to this project are directly related to the development of devices with a decisive and immediate impact in areas of wide social interest. As an example we can observe the clear social approach of some of the projects that benefit from this action: "microencapsulation" that allows to contain within a capsule a desired active ingredient, and protect it against external agents, to increase the conservation of the fragrances present in the softener; in the future, graphene, a nanometer substance composed of pure carbon, will allow medical implants to treat depression, Parkinson's and epilepsy in a much more effective way, etc ...



6. Compliance with horizontal principles (sustainable development, equality between men and women and the principle of non-discrimination) and environmental legislation

The institute assumes the commitment of equal opportunities and diversity management as a constitutive element of its corporate identity. The principle of equal opportunities for men and women is integrated at all organizational levels with the aim of promoting the increase in the number of women in a traditionally highly masculinized area of science. The principle of non-discrimination is followed in all personnel selection processes and an attempt is made to achieve gender balance among employees at all professional levels.

Regarding the environment, the facilities enabled by this project, as well as all the research activities carried out in the center, are governed by the legislation in force as regards the treatment of waste and contaminated soils. Therefore, the generated waste, both chemical and biological, are properly classified in their containers and are managed by personnel authorized by the competent administration, thus contributing to the reduction of the environmental impact. In addition, the very construction of the biological room has the channeling of the air flow through negative pressure and special filters designed to produce an internal feedback of air and ensuring that no biological element can escape to the outside.

Finally, the proposed design for the Nanofabrication Room complies with all regulations in design and construction and in occupational and environmental safety.

7. Synergies with other policies or instruments of public intervention

By providing state-of-the-art facilities suitable for the manufacture, characterization and testing of new materials and devices, the Catalan Institute of Nanoscience and Nanotechnology contributes to strengthening the field of nanotechnology, one of the prioritized transversal facilitating technologies of the Research Strategy and Innovation for the Smart Specialization of Catalonia (RIS3CAT).

These facilities will also make possible to carry out a wide range of experimental activities in the field of nanofabrication by external users, since they will be accessible to other research centers that do not have these types of infrastructures.

Finally, thanks to the co-financed project, the Institute shall increase its experimental research capacity, which allows it to expand its participation in national and international scientific infrastructure networks, such as NFFA-Europe (The Nanoscience Foundries and Fine Analysis), a platform of free access to advanced tools for research in nanoscience.

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