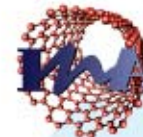


# institute of NANOSCIENCE of Aragon

M. Ricardo Ibarra

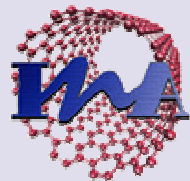
<http://ina.unizar.es>

[ina@unizar.es](mailto:ina@unizar.es)



# New building



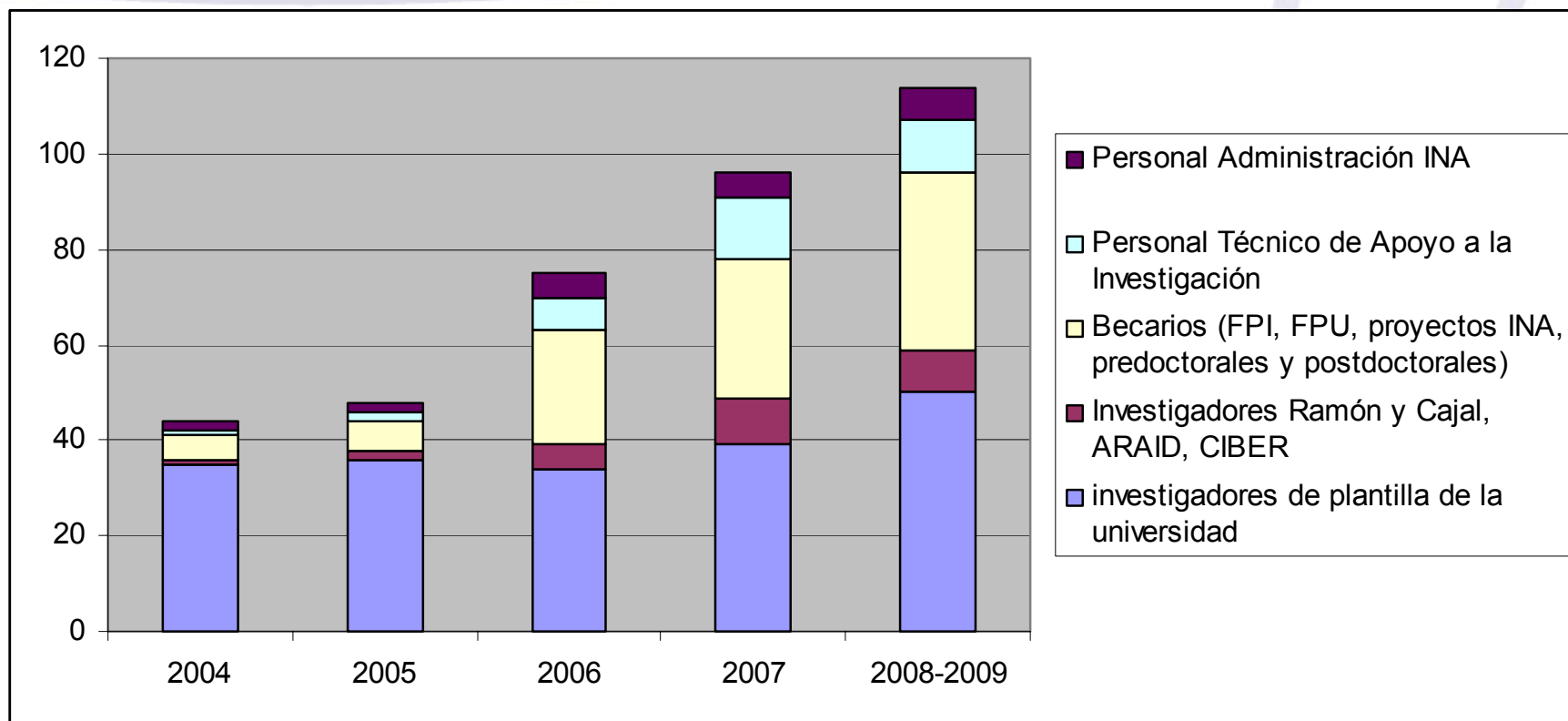


## Our Institute

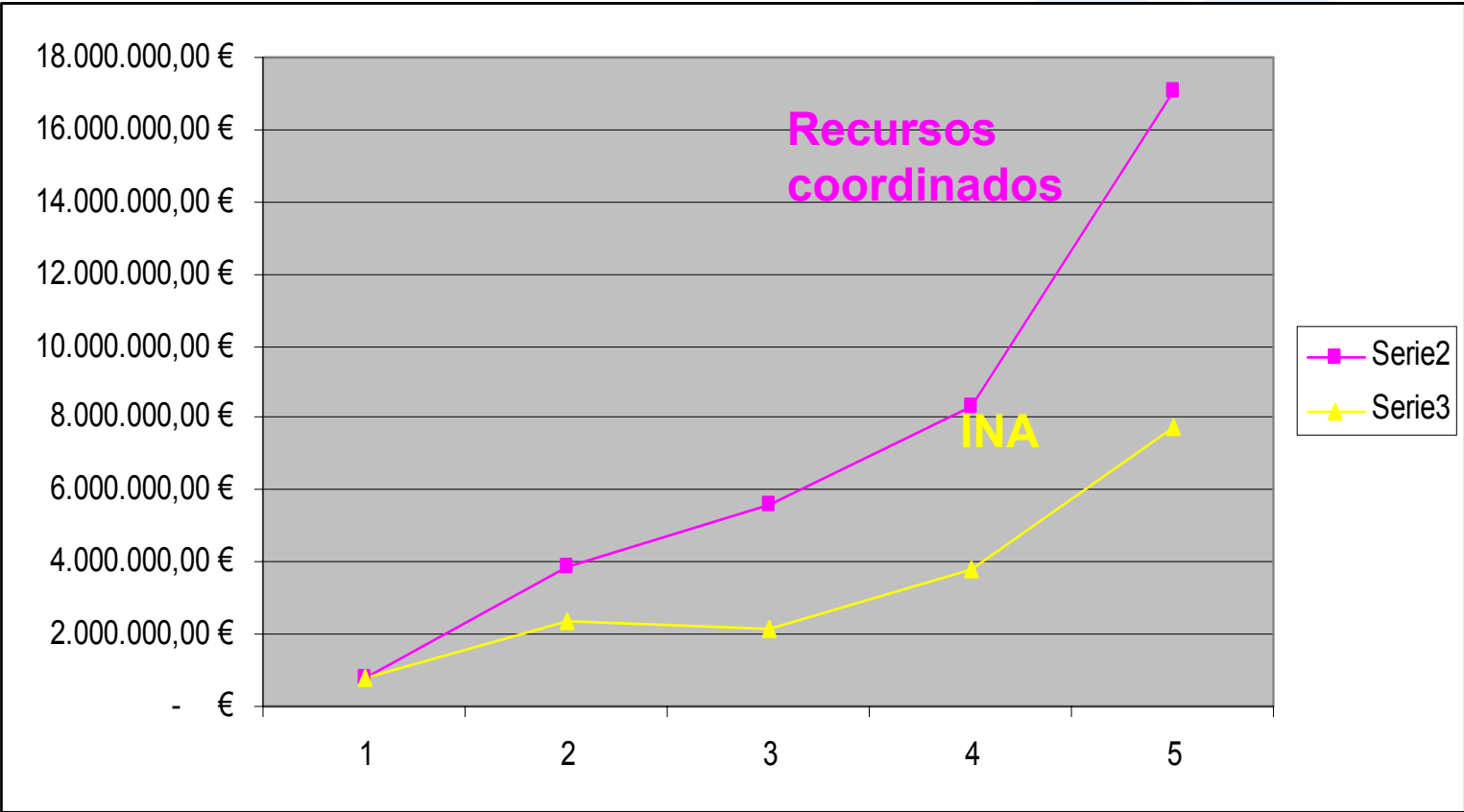
- **Research in Nanoscience and Nanotechnology**
- **Established in 2003**
- Located in **Zaragoza**
- 115 employees (40 Staff, 21 Postdoctoral Fellows, 35 PhD Students, 12 Laboratory Technicians, 7 in Administration)
- Truly multidisciplinary
- Application-oriented: 13 Patents + spin-off company (last 3 years)
- Funding: EU (STREP-type), EU (Networks of Excellence), National (standard), National (Large: CIBER, Consolider), industry
- Learning Programme:



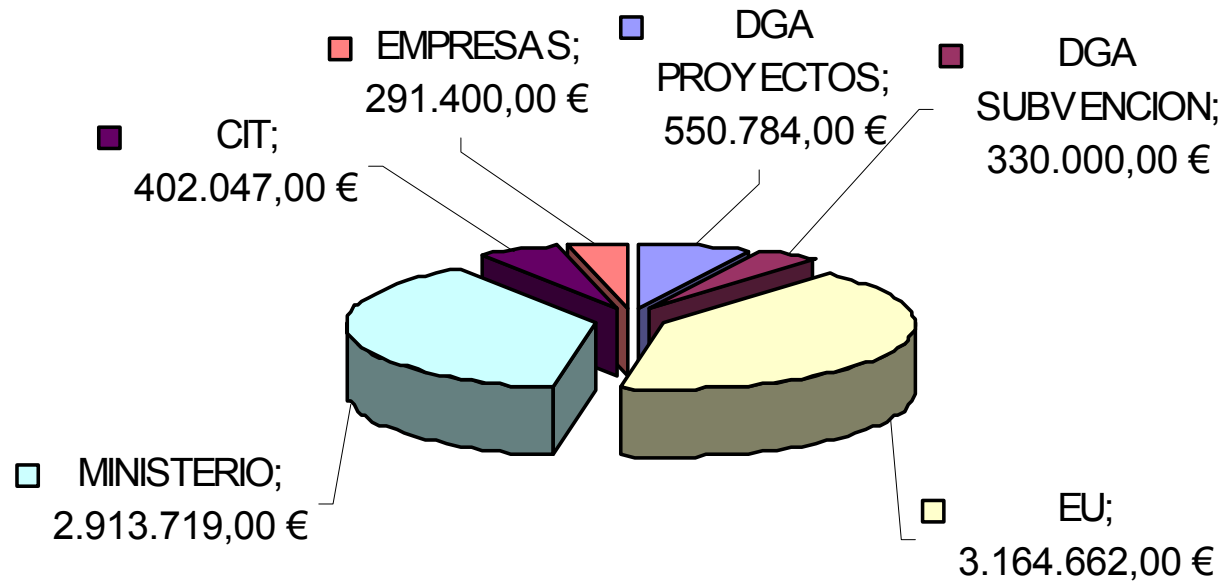
## PERSONAL DEL INA



# PROYECTOS DE INVESTIGACION CONVOCATORIAS PUBLICAS



## Nº DE PROYECTOS VIVOS EN 2009 TOTAL RECIBIDO INA



■ DGA PROYECTOS  
 ■ DGA SUBVENCION  
 ■ EU  
 ■ MINISTERIO  
 ■ CIT  
 ■ EMPRESAS

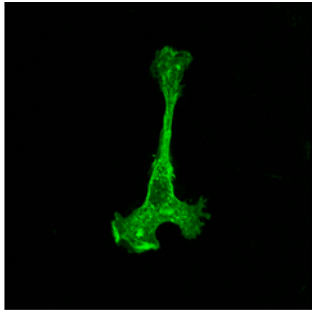
ENTIDAD FINANCIADORA	PROYECTOS VIVOS EN 2009	TOTAL COORDINACIÓN INA	TOTAL RECIBIDO INA
DGA	13	612.670,63 €	550.784,00 €
EU	4	7.914.146,00 €	3.164.662,00 €
MINISTERIO	20	6.764.790,00 €	2.913.719,00 €
CIT	2	1.087.440,00 €	402.047,00 €
EMPRESAS	4	291.400,00 €	291.400,00 €
<b>TOTAL</b>	<b>43</b>	<b>16.670.446,63 €</b>	<b>7.322.612,00 €</b>



## RESEARCH LINES

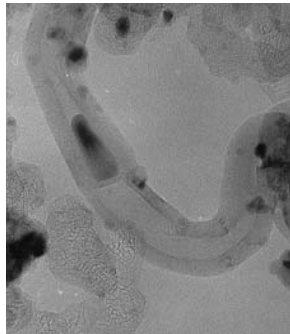
### NANOBIOMEDICINE:

- **Therapy:**
  - **Drug Delivery**
  - **Hyperthermy**
- **Diagnótic:**
  - **Contrast agent (biomolecular and celular targeting)**
  - **Biosensors: Quantitative lateral flow.**



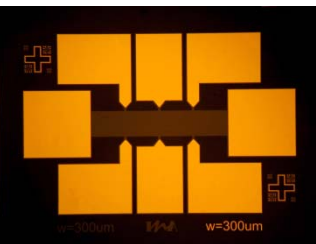
### NANOSTRUCTURED MATERIALS:

- **Membranes and nanoporous films**
- **Carbon nanotubes**
- **Organic functionals materials (dendrimers, mesosocopic liquid crystals)**
- **Core-shell magnetic nanoparticles**



### PHYSICS AT THE NANOSCALE:

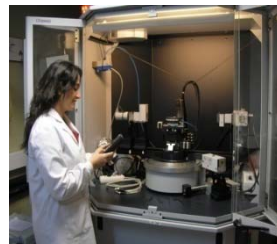
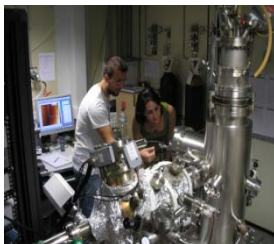
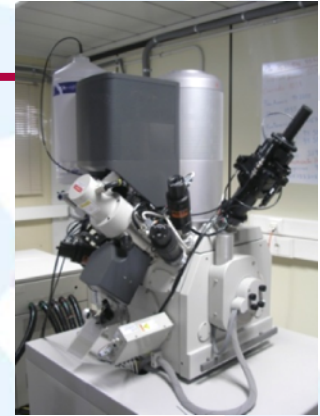
- **Thin films: magnetic heteroestructures, superlattices...**
- **Micro- Nanocircuits: Spintronics, quantum effects, nanowires, nanoconstrictions, MEMS&NEMS...**



# Infrastructures

---

1. Laboratory of thin films growing
2. Laboratory of lithography
3. Laboratory of scanning probe microscopy
4. Laboratory of electron & “Dual beam” microscopy
5. Laboratory of biomedical applications
6. Laboratory of synthesis and functionalización of nanosystems
7. Laboratorio of characterization of nanostructures





# Clean room



## PRESENT

**(20 m<sup>2</sup>, CLASS 10.000)**

Photoresist station

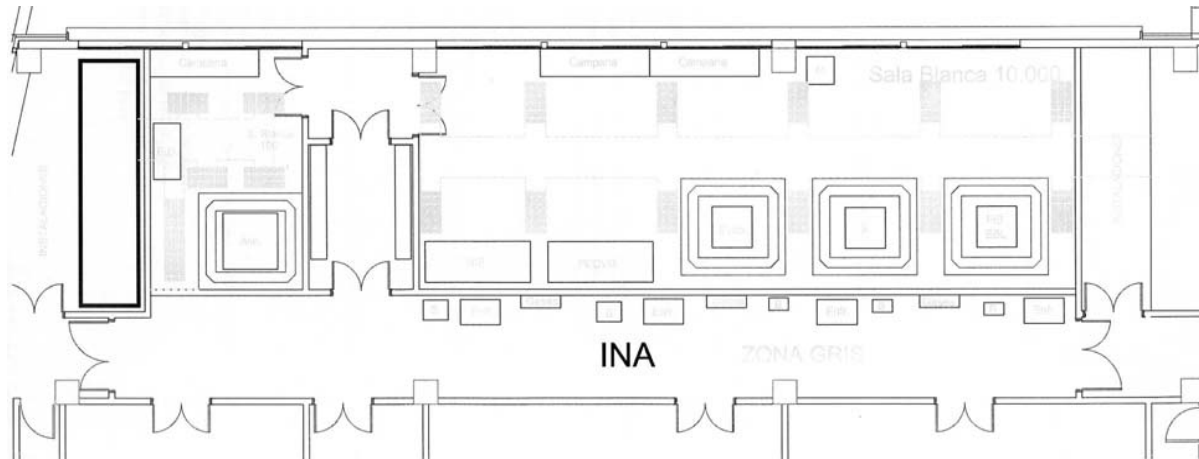
mask aligner

e-beam evaporator

RIE / IBE

PECVD

μcontacts, optical microscope, saw

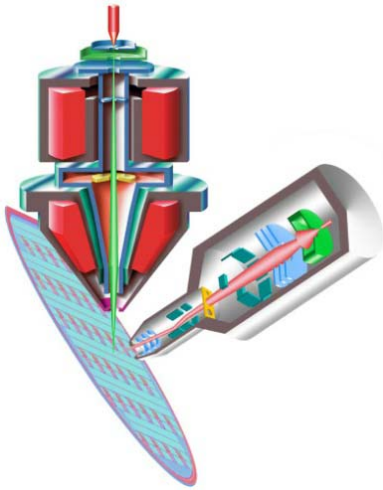


## End 2009

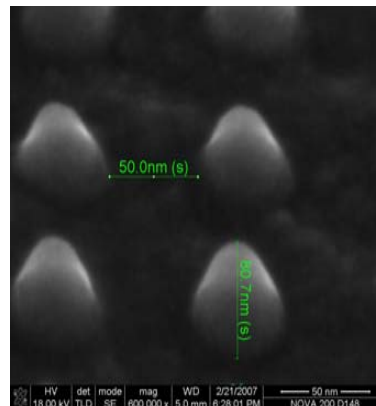
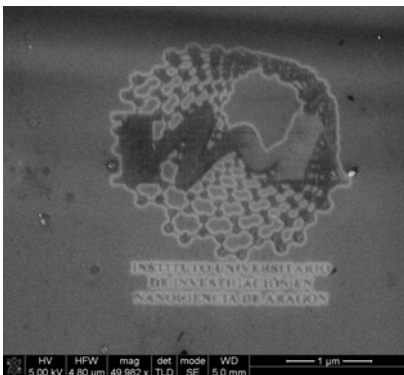
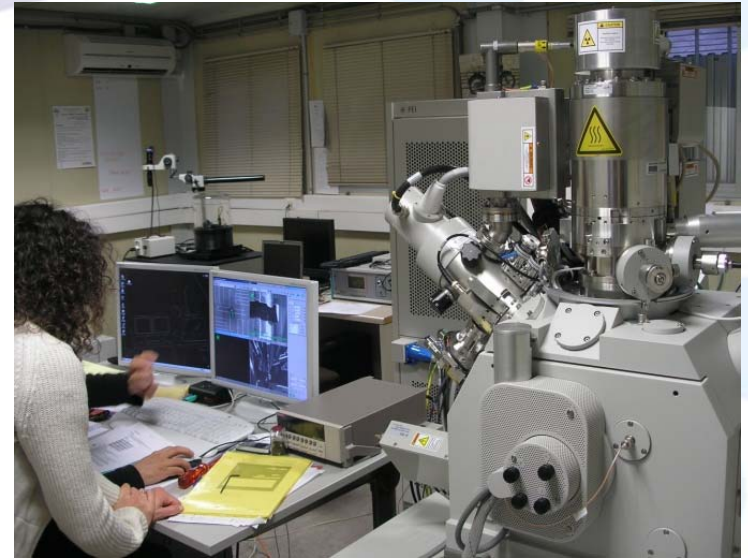
**(125 m<sup>2</sup>, CLASS 10.000 &  
CLASS 100)**



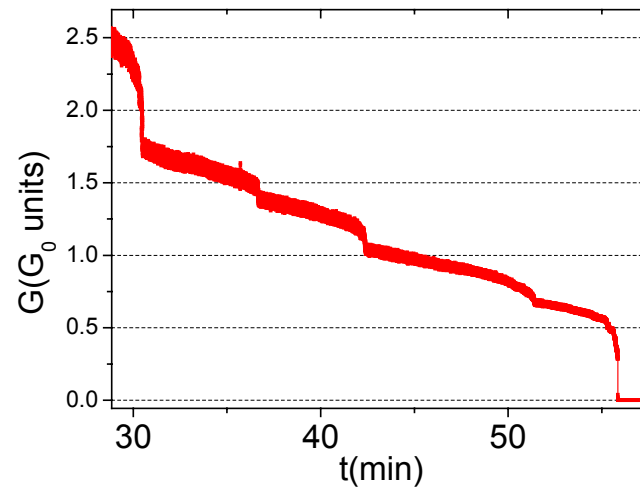
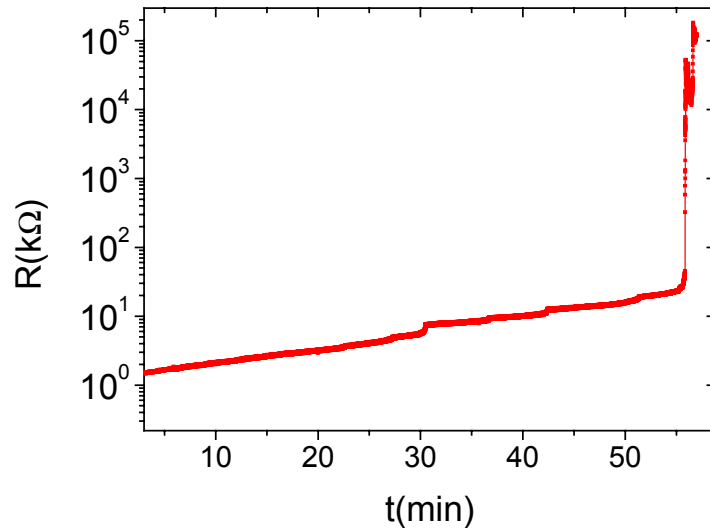
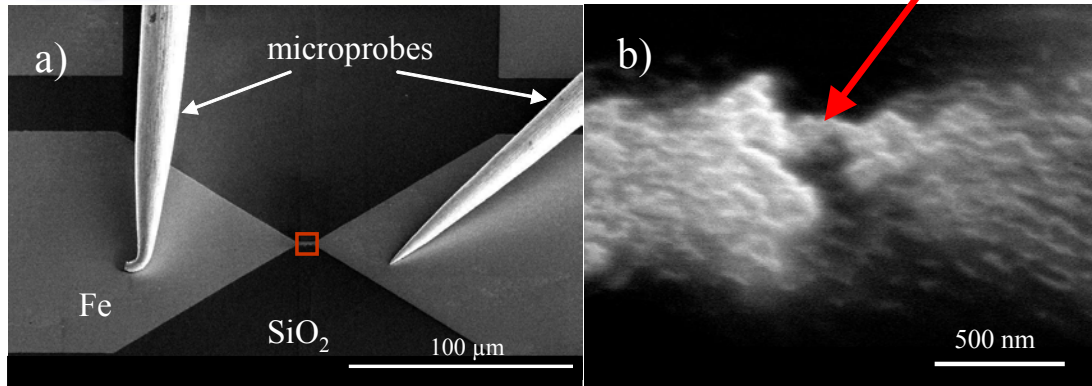
# Laboratory of Nanolithography: "Dual beam" microscopy



**Imaging**  
**Ectching**  
**Deposition**  
**Analysis**  
**Nanopatterning**  
**e-beam lithography**



# Fe nanoconstrictions by FIB

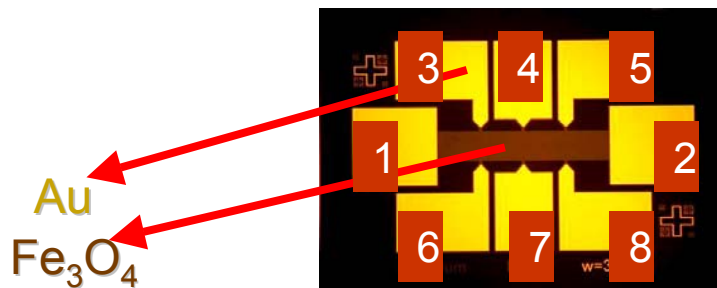


A. Fernández-Pacheco, J.M. De Teresa, R. Córdoba,  
and M.R. Ibarra, Nanotechnology 19 (2008) 415302

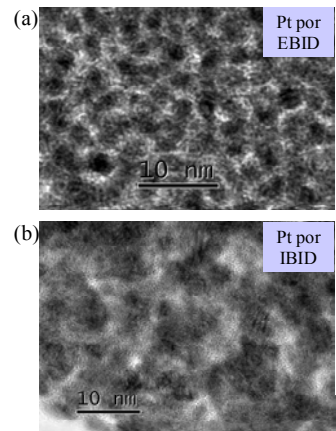
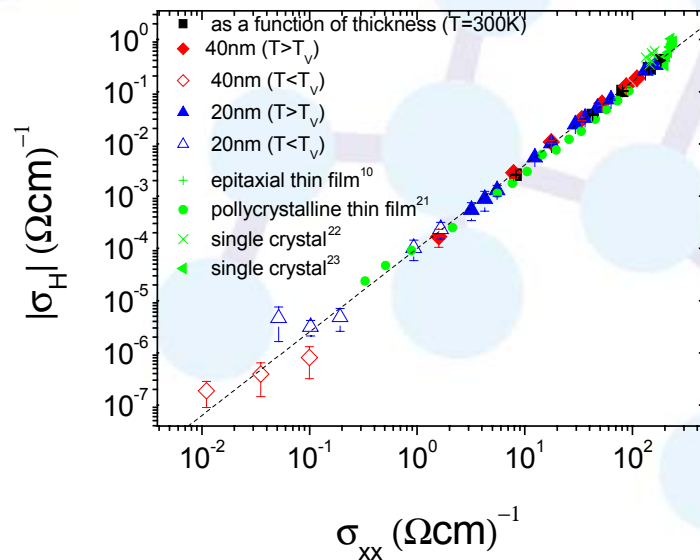
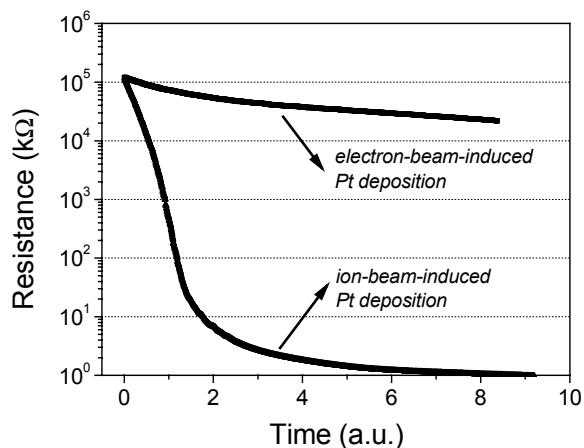
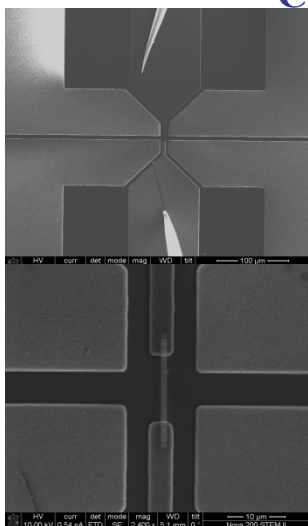


# Spintronics

## HALL EFFECTS IN EPITAXIAL MAGNETITE THIN LAYERS

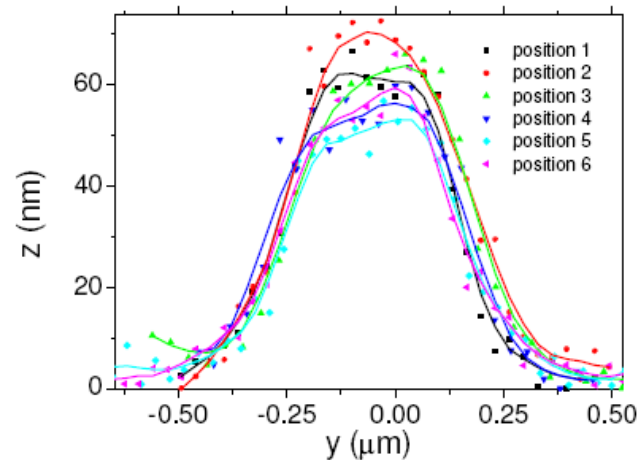
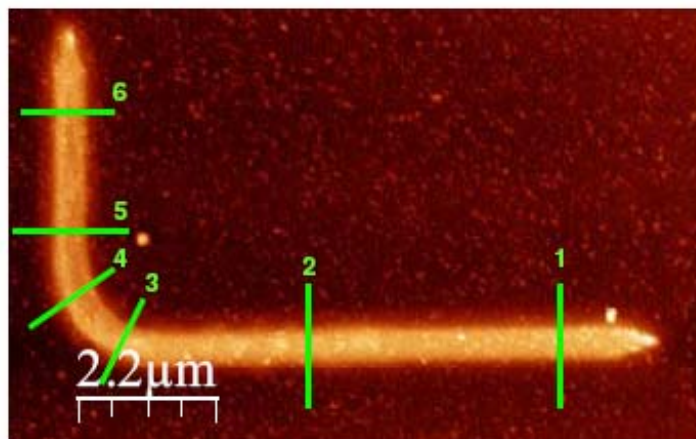
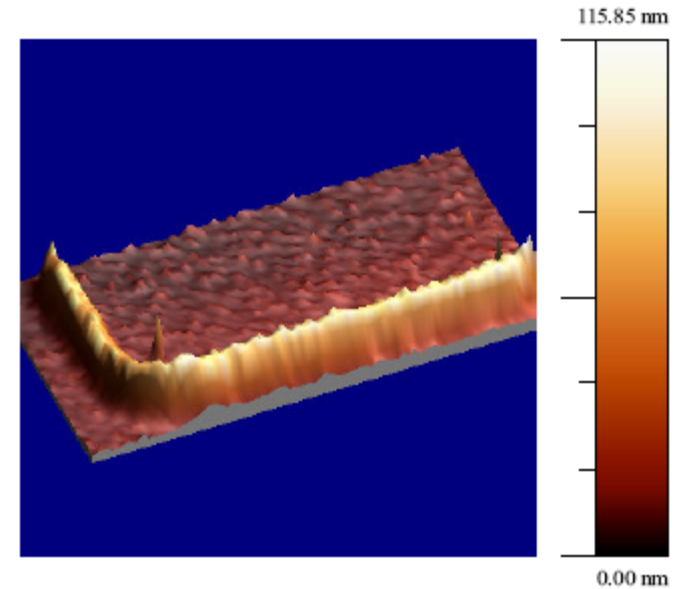
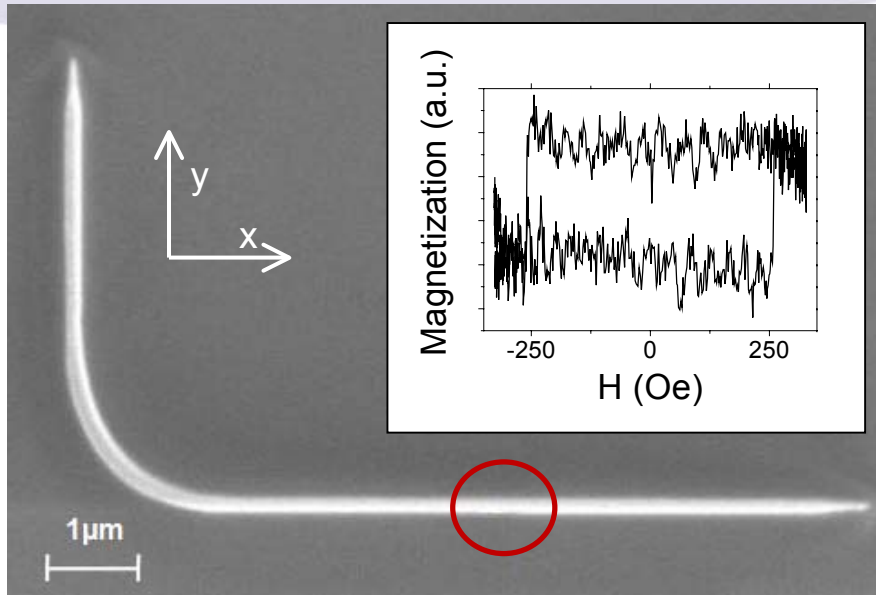


## NANODEPOSITION AND ELECTRIC CONDUCTIVITY



# Focused electron beam induced deposition of Co

## Domain wall propagation in FEBID Co nanowires



⇒ Good control in the shape, thickness and width of the nanowires



# Micro and Nanoelectronics

## MEMs y NEMs (Micro and Nanoelectromechanical systems)

- MEMs based on zeolite for gas sensors
- MEMs and NEMs. For individual molecules measurements: superconductor nanomagnets, nanothreads.



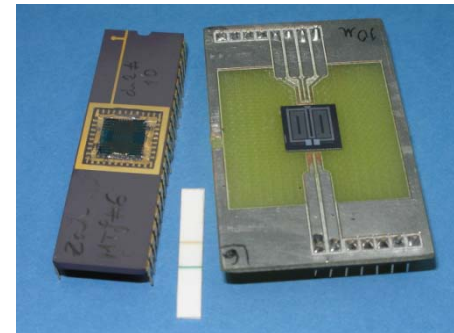
## Superconductors for use in SQUIDs

Inductive systems for ferromagnetic nanoparticles sensors (see biosensors)

Metal Coatings for microcircuits

Insulating covers for microcircuits

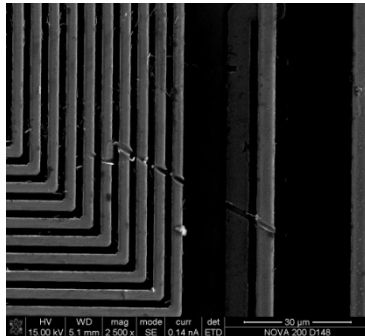
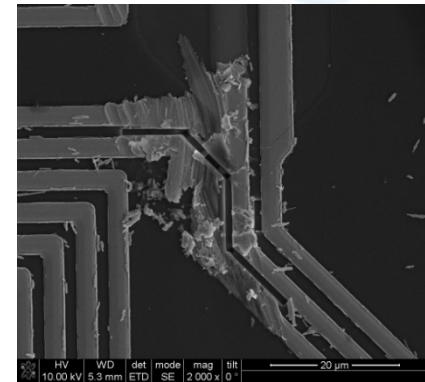
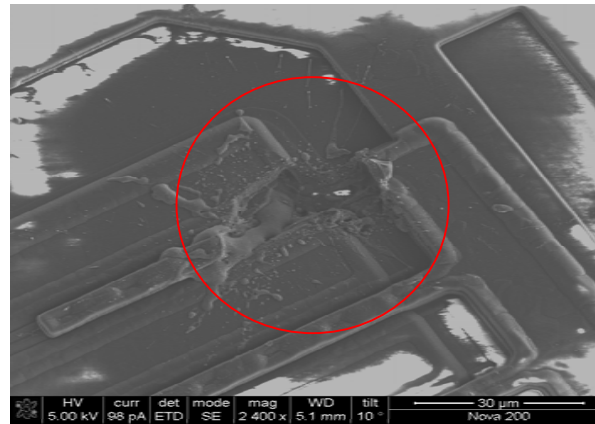
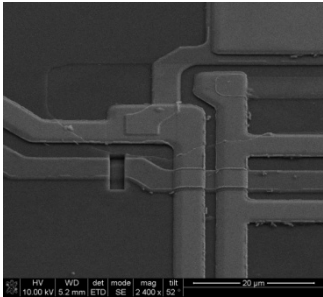
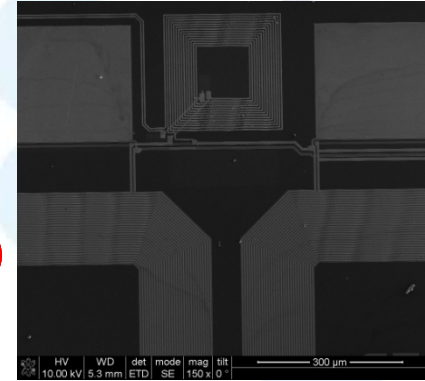
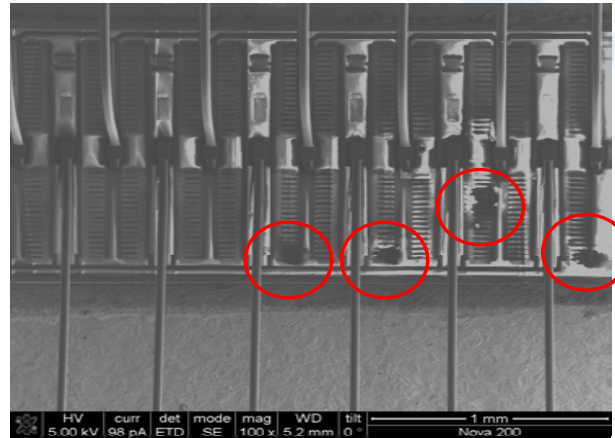
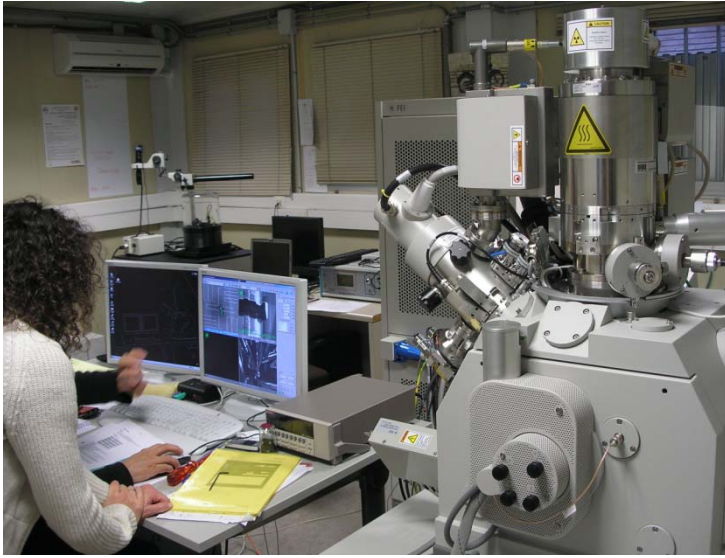
Coatings to improve chemical agents, resistance.



Biosensors; Inductive and magnetoresistive sensors



# Integrated circuits inspection and repair





### Technology partners





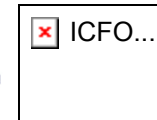
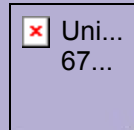
# Nanoaracat

ARAGON

CATALONIA



19 centers:  
14 institutes  
5 universities



UNIVERSITAT DE BARCELONA



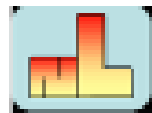
UNIVERSITAT POLITÈCNICA DE CATALUNYA



UNIVERSITAT ROVIRA I VIRGILI



and their applications



## 2<sup>nd</sup> Spanish Workshop on Nanolithography



Campus de la Universitat Autònoma de Barcelona, Bellaterra, Barcelona  
November 10th-13th, 2008

**Second Spanish Workshop on Nanolithography**  
*(Nanolithography, nanopatterning, self-assembly, atomic  
and molecular manipulation, and their applications)*



# Academic-Industrial Sessions



- 2007 → I Nanotechnology Applications for Industry (AIN) (Barcelona) **195 assistants.**
- 2008 → II AIN (Barcelona) **206 assistants.**

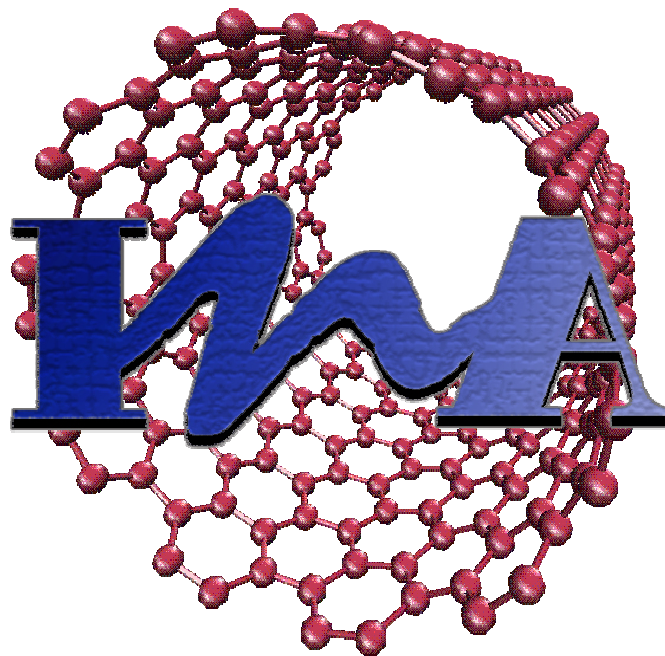




- # Essential details
- # General information
- # Objectives
- # Who should apply
- # General Information provided by the University of Zaragoza
- # General Information about Nanoscience and Nanotechnology
- # Course modules
- # Master's Committee
- # Facilities and Equipment
- # Matriculation procedure and fees

## Objectives

The objective of this master is to provide **high-quality University Multidisciplinary Education** in the synthesis, assembly, properties and characterization of nanostructured materials as well as **practical experience and skills** in the fabrication of nanodevices. All modules are taught in English.



**INSTITUTO UNIVERSITARIO  
DE INVESTIGACIÓN EN  
NANOCIENCIA DE ARAGÓN**

*<http://ina.unizar.es>*

*[ina@unizar.es](mailto:ina@unizar.es)*

**THANK YOU FOR YOUR ATENTION**