



**ICTS** Integrated Micro  
and Nanofabrication  
Clean Room



**CSIC**

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



Centro Nacional de Microelectrónica



IMB

**IMB** Barcelona  
Microelectronics Institute

# ICTS Integrated Micro and Nanofabrication Clean Room

The ICTS "Integrated Micro and Nanofabrication Clean Room" is a large scale facility embedded administratively in the Barcelona Microelectronics Institute - National Microelectronics Center (IMB-CNM), a research center belonging to CSIC. It has however a separate and well defined structure and operating policies.

The ICTS is the main facility supporting the R&D activity of IMB-CNM. In addition, it is an open access facility for any R&D institution or SME needing its processing and technological capabilities for R&D purposes or small series production of prototypes.

The clean room was inaugurated in 1991 with a surface of 1000 m<sup>2</sup>, and has been recently upgraded to 1500 m<sup>2</sup>. It has the capability of fabricating integrated devices with CMOS processes and includes microsystem-specific and nanofabrication processes.

The process quality (in terms of reliability and repeatability, which are of great importance for fabrication, innovation and research objectives) is guaranteed by:

- The strict compliance of established protocols
- Use of advanced equipment
- The experience and expertise of the technical staff



## GICSERV access programme

The GICSERV programme, funded by MICINN, provides funding for limited-scope projects accessing the ICTS. It started in 2006 and operates by annual calls. In the period 2006-2010, GICSERV has funded 212 projects, 15% of them from foreign countries\*, in many different fields, from silicon microsystems to biology and high-energy physics.

\* The programme is open to applicants from EU countries, and since 2010 also to Iberoamerican countries.

## IMB-CNM

CNM was created in 1985. Its Barcelona Microelectronics Institute has a staff of about 200 people (end 2009). Its main activity is research and development, mainly oriented towards applied research in the fields of silicon-based micro and nano technologies, devices and systems.

The R&D activities are mainly driven by competitive research projects funded by institutions such as the European Union and the Spanish Ministry of Science and Innovation. Additional activities include industrial R+D+I contracts (technical and consulting services, technological and pre-industrial research, technology transfer, design and fabrication of prototypes and small series), and postgraduate and industrial training.





## Thermal Processes and CVD

The following thermal and Chemical Vapour Deposition based processes are available:

- > Oxidation, annealing and diffusion processes on tubular furnaces.
- > Deposition of silicon oxides and nitrides, polycrystalline silicon and BPSG on LPCVD and PECVD systems.
- > Deposition of high-k dielectrics on a thermal ALD system.
- > High temperature RTP processes for SiC technology.

## Ion Implantation and Metals

Two medium current ion implantation systems are available for implanting a number of species: B, P, As, N, Ar, Al, Si, Mg, O, He.

Metal thin films can be deposited on either DC and DC/RF sputtering systems, or thermal and e-beam evaporation systems.

## Dry Etching

A number of dry etching (plasma-based) systems and processes are available:

- > Reactive Ion Etching (RIE) systems for aluminum, polysilicon, silicon oxide and silicon nitride materials.
- > Deep Reactive Ion Etching (DRIE) systems for deep silicon and silicon dioxide etching.
- > Photoresist ashing.

## Microsystems Processes and Wet Etching

Various microsystems-specific processes are available:

- > Silicon anisotropic wet etching with alkaline solutions.
- > Surface micromachining (sacrificial layer etching).
- > Critical point drying for releasing micromachined structures.
- > Lift-off etching processes.

In addition to wet etching of various materials and wafer cleaning processes.

## Nanolithography

The following processes are available for achieving sub-100 nm resolution:

- > Electron beam lithography.
- > Nanoimprint lithography.
- > Nanoimprint Step and Flash lithography.
- > Focused Ion Beam system.
- > AFM lithography.

## Photolithography

The following systems are available for standard optical lithography:

- > g-line and i-line steppers.
- > Contact/proximity and double-side contact/proximity mask aligners.
- > Automatic coating/developing system.
- > Mask-Less laser lithography (i-line).

## Post-processes

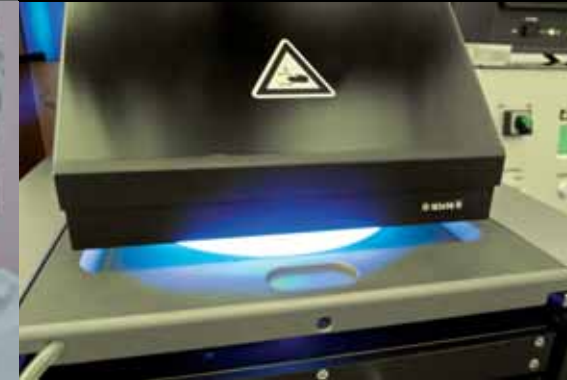
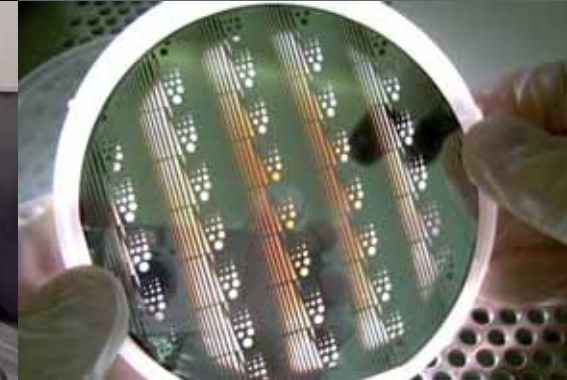
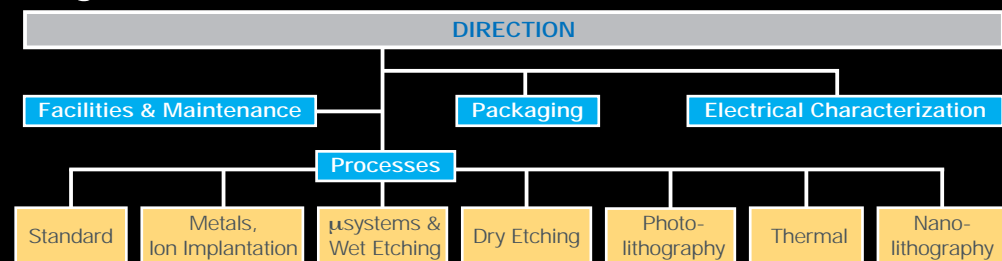
### Packaging

- > Wafer dicing.
- > Die bonding processes, including SMD and flip-chip die assembly.
- > Wire bonding.

### Electrical Characterization

- > Device Characterization and parameter extraction.
- > Parametric test of fabricated wafers.
- > Test structure design and characterization.
- > Development of new measurement techniques.

## Organization





MINISTERIO  
DE CIENCIA  
E INNOVACIÓN



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