



## NANOFABRICATION DIVISION

Led by Dr. Nikolaos Kehagias, the Nanofabrication Division focuses on the design and development of nanofabrication methods and techniques for nanoscience and nanotechnology research and applications. The mission of the division is two-fold: (a) to create and provide a flexible nanofabrication platform capable of processing a large variety of materials and substrates and (b) to provide high quality services to both internal and external users. An important task of the division is to offer the opportunity for process development or prototyping of novel nanostructures and devices with the aim of transferring research output to commercial foundries. For the ICN fabrication division, it is essential to combine lithography techniques and materials to support research in achieving high impact results.

### BACKGROUND

The key to progress in nanoscience and nanotechnology depends on the ability to design and fabricate samples for the experimental work. In order to understand the fundamentals of science fabrication of nanostructures in a variety of materials with accuracy in the nanometer scale and sometimes in the molecular scale is essential. To this effect the ICN fabrication division has infrastructure for different lithography methods, including lithography based on electron beams and focus ion beams, thermal and UV light-assisted nanoimprint lithography, self assembly techniques, metal evaporation techniques and etching processes.

The ICN Nanofabrication Division supports the institute's research groups in: nanoelectronics, nanophonics, nanophotonics, spintronics, nanobioelectronics and biosensors.

### RESEARCH ACTIVITIES INCLUDE:

#### Novel Nanopatterning Methods

One of the main outputs of the laboratory is the development and implementation of novel nanopatterning methods. In principle we use imprint based methods to pattern polymers but, depending on the targeted application, these could also be tailored to pattern metals. Emphasis is given to develop nanoimprint based lithography techniques as cost, feasibility and throughput are features required for industrial demonstrators. Strong efforts are in place to reach reliably sub 20 nm features sizes as well as to fabricate three dimensional structures.

#### Flexible processing

A key feature of the ICN fabrication laboratory division is the flexibility allowed in processing. It will continuously develop and establish good practices to allow processing of organic and inorganic materials minimising contamination risks. Likewise it will support and develop methodologies to work on hard and flexible substrates.

#### Collaboration with national and international entities

The division operates in close collaboration with all research groups within the institute supporting the nanofabrication and research needs of ICN. Moreover, joint research projects and access to the laboratories facilities is encouraged for external users. Particular interest is given to training of young scientists in fabrication techniques. The Division has strong collaboration with leading European institutes and companies in the areas of nanoscience and nanotechnology and will become increasingly involved in regional, national and European infrastructure networks to complement and share its facilities. At present the division participates in the Spanish NANOLITO lithography network. Examples of current European projects it supports are NAPANIL, NANOPACK, TAILPHOX, LAMAND, NANOFUNCTION and TRAIN2.



**DR. NIKOLAOS KEHAGIAS**  
DIVISION LEADER

Dr Nikolaos Kehagias graduated from the Physics department of Aristotle University in Thessaloniki, Greece in 2002. He has a Master degree in "Physics of laser communications" from Essex University, UK. He obtained his PhD in 2007 from the National university of Ireland, Cork where he continued to work as a post doctoral fellow until May 2008. He joined the ICN in May 2008, first as member of the Phononic and Photonic Nanostructures Group. He is author of 24 journal publications, including 2 book chapters in the field of nanofabrication and nanoimprint lithography, in particular and has pioneered the use of RUVNIL – in full. Since July 2010 he leads the Nanofabrication Division of ICN.

