Nanofactory to generate next generation of sensors or tools with very high precision in the field of micro and nano-electronics, micro or nano-sensors, micro or nano-surgery

Summary

A French research Institute renowned in the robotics field has implemented a station to produce next generations of sensors or tools by functionalizing, patterning, assembling materials with very high precision. The Institute is seeking research and technical cooperation with industry or academic partners to explore new ways for manufacturing and push the limit of miniaturization.

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Details

Description

The Nanofactory developed by the French Institute is working under vacuum with 3 arms and at least 14 DoF (Degrees Of Freedom). The station is able to cut, etch, fold, assemble and then stick or weld a lot of different materials.

The control of the operation is done by SEM or FIB picture, The gas -XeF2 for etching, Carbon and Platinum for depositing are injected by GIS (Gaz Injection System).

The originality of this station is the installation of all the components in the same vacuum chamber, especially the robotic structure inside the chamber. The main strength of the nanofactory lies on the control of the station by several engineers in the field of robotics in closed loop nanotechnology process - patterning, sputtering, etching-, electronic and mechanics for tool manufacturing.

The station is very powerful and ideal for producing a lot of new generations of sensors and tools in the field of micro and nano electronics, micro or nano-sensors, micro or nano-surgery. This station enlarge the scoop of cleanroom process with the capability to pick and place devices in real three-dimensional structures.

The station is built around a dual beam SEM / FIB Auriga 60 from Zeiss Microscope. The SEM (Scanning Electronic Microscope) column corresponds to a FEG tip from Zeiss. The FIB (Focused Ion Beam) is manufactured by Orsay Physics and it was installed at 54° from the SEM. The Eucentric point is located at a working distance of 5.5 mm form the SEM column. The GIS (Gas Injection System) is produced by Omniprobe with retractable nozzle. Actually the GIS

is working with three gases, one for etching -XeF2- two for sputtering - carbon and platinum - in combination with low FIB bombardment.

The first manipulator corresponds to a Kleindiek one in open loop with 3 DoF (Degrees of Freedom). The second micro-robot is built with 6 SmarActs axis. It is homemade, and all the robotic controls are in small loop. The SmarAct micro robot is fixed on the part of the vacuum chamber with a very high precision of less than 10 nm, 2 nm in the better case. The micro robot is located in a corner of the chamber in order to let the substrate holder of the SEM rotate from -15° to + 54°, for complex assembly.
It's also possible to install in the chamber several other equipment as infrared controller for acoustic or optic measurements with electrical and otpical bulkhead crossing for ex-situ control, traction engine, machining tower... Other accessory like laser, ion gun, or microwave excitatory could also being installed for specific research.

The Research Institute is seeking cooperation with industry willing to manipulate and assemble very small components and to push back the frontiers of what is possible. It can be for instance the design of very small sensors or tools which could be introduced in blood, body, milk, water, aggressive solutions for tracing specific micro-organisms or micro/nano molecules. It's also possible to imagine electrical, thermal or optical detection.

Cooperation with academic partners is also possible. The Institute is open to cooperate under H2020 or other European projects.

Advantages and Innovations

All the equipments are in the same installation : it means the SEM and FIB columnar, the GIS for etching the XeF2 or sputtering with carbon and platinum and at the end the two micro robots. All the controls are possible for active optical assembly with optical bulkhead crossing. It is also possible to realise electrical control or action for MEMs or MOEMs three-dimensional building.

Stage of Development

Concept stage

Comments Regarding Stage of Development

Since 2015, the station has begun to produce sensors, optical opto-polymerisable tips, photonics crystals, mirror, filter, acoustic micro-systems.

IPR Status

Secret Know-how

Profile Origin

National or Regional R&D programme

Keywords

Technology

01001001	Automation, Robotics Control Systems
02002018	Microassembly, nanoassembly
02007009	Materials Handling Technology (solids, fluids, gases)
02007024	Nanomaterials
05005	Micro- and Nanotechnology

Market

08001012	Speciality metals (including processes for working with metals)
08002004	Robotics

NACE

M.72.1.9	Other research and experimental development on natural sciences and engineering

Network Contact

Issuing Partner

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Open for EOI : Yes

Dissemination

Send to Sector Group

Nano- and Microtechnologies

Client

Type and Size of Organisation Behind the Profile

Industry 250-499

Year Established

1970

Already Engaged in Trans-National Cooperation

No.

Languages Spoken

English
French

Client Country

France

Partner Sought

Type and Role of Partner Sought

Type of partner sought : innovative SMEs dealing with nano-electronics, nano-optics, nano-mechanics, companies in different sectors from agro-food to healthcare

Role of the partner : needing to manipulate micro and nano components for different type of operations : cutting, etching, folding, assembly, sticking or welding, interested in further miniaturization and/or willing to functionalize materials, co-development of MEMs, MOEMs, micro-systems, sensors...

Type of partnership considered : Research and technical cooperation as for instance studying, testing, proof of concept.

Type and Size of Partner Sought

SME 11-50,University,R&D Institution,SME <10,>500 MNE,251-500,SME 51-250,>500

Type of Partnership Considered

Technical cooperation agreement
Research cooperation agreement

Attachments

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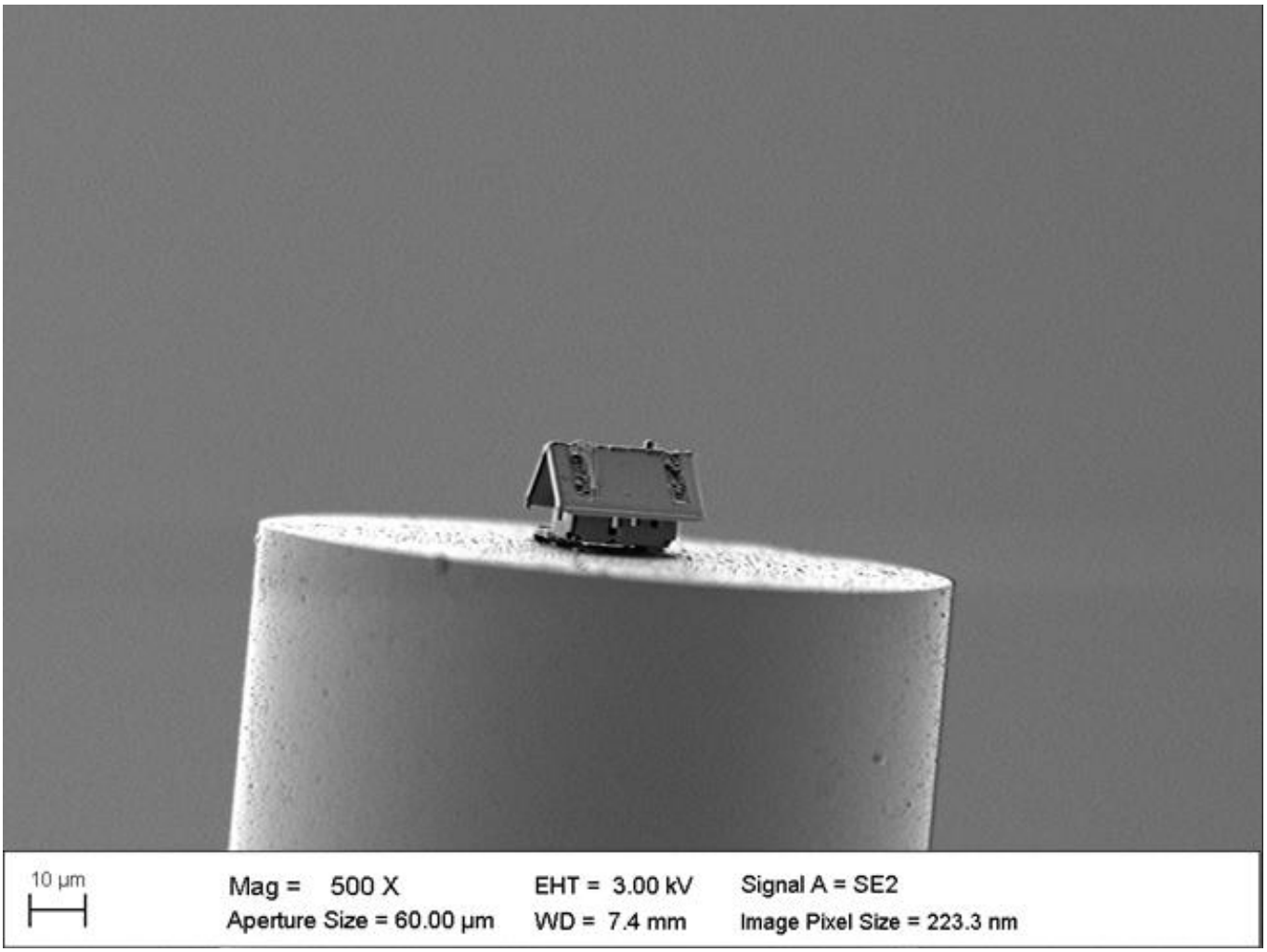
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