

Platform nanoRennes



**Discover our expertises and
facilities for your technological
developments**

C. Levallois (Institut FOTON) & M. Harnois (IETR) Scientific leaders
O. De Sagazan (IETR) &
R. Gautheron-Bernard (Institut FOTON) Technical leaders

nanoRennes, platform of RENATECH+

nanoRennes is the reference platform in micro-nanotechnology in the West part of France.

nanoRennes platform, labelled by the CNRS since 2008, belongs to the RENATECH+ network.

5 platforms (8300m²)

***5 laboratories**

***145 engineers and technicians**

***130 Meuros of equipments**



27 regional platforms (7300m²)

***33 laboratories**

***139 engineers and technicians**

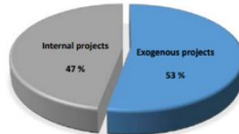
***119 Meuros of equipments**



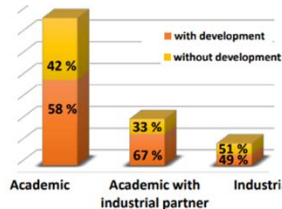
1096 projects in 5 platforms of which 589 exogenous projects



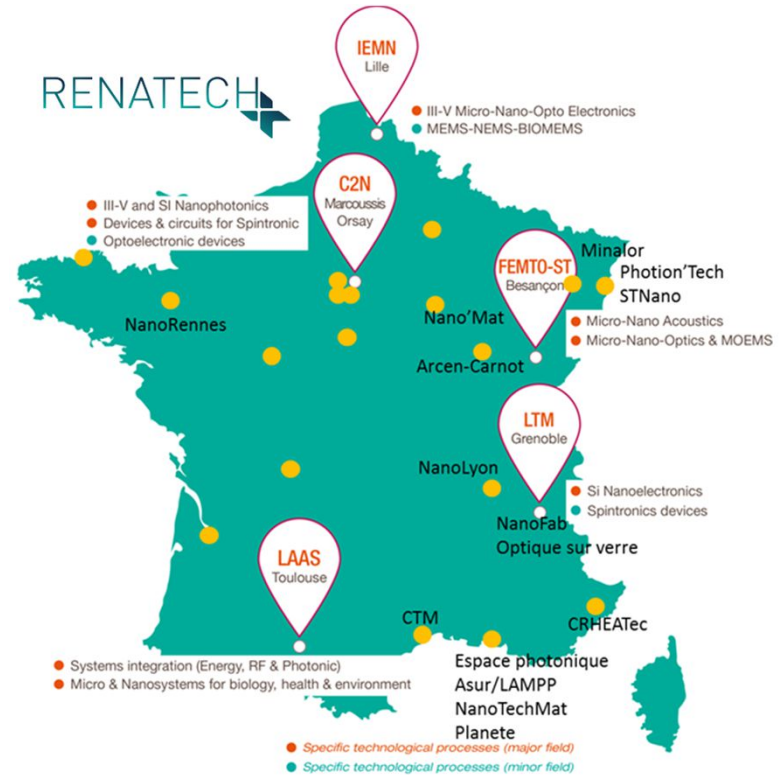
* exogène : Projet scientifique porté par un laboratoire hors RENATECH



2/3 of exogenous projects are realized with development



Statistics from RENATECH network



A French network getting access to a large technological facilities and multiple experts with support for your developments.



2 laboratories, 2 teams, 3 supervisory authorities, 2 locations

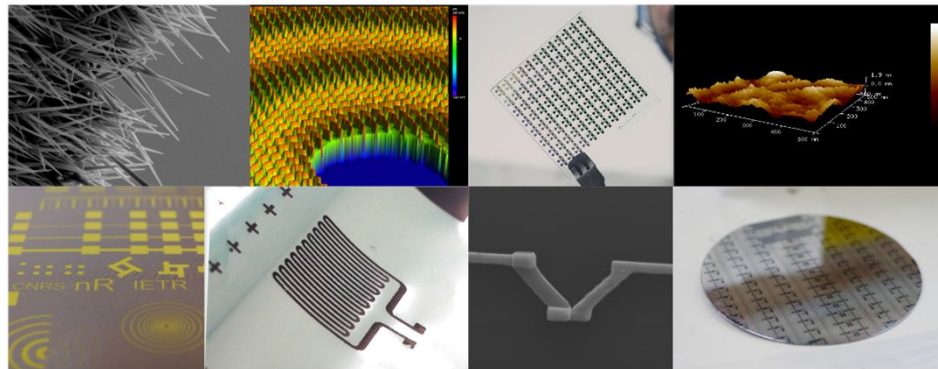


OASiS

(OrgAnic and Silicon Systems)

University of Rennes – building 11D

Development of **fabrication process** for “**green**” **electronics**, **3D electronics** and based on **nanostructures**. Elaboration of **sensors** for health, energy & food production

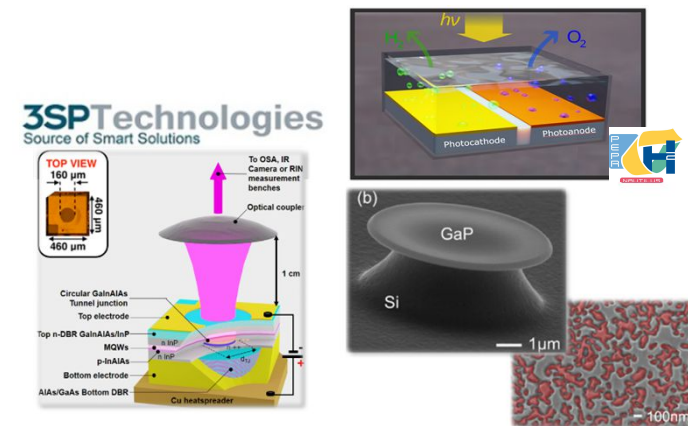


OHM

(Optoelectronics, Heteroepitaxy and Materials)

INSA - building 10

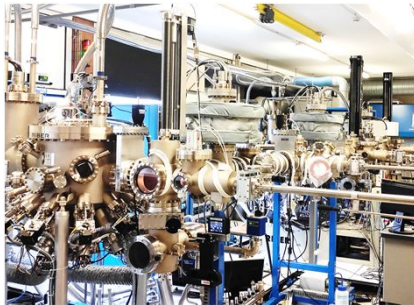
Development of devices for **photonics** (lasers, resonators..) and for **photo-generation and energy storage** (solar cells, production of green H₂) based on III-V, III-V/Si materials



Journées Plénières GDR NAME– 10/11/2023



300m² of clean rooms + 500m² of grey areas with differentiated technical expertises & facilities for device fabrication



Equipex+ NANOFUTUR, nR

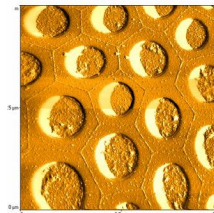
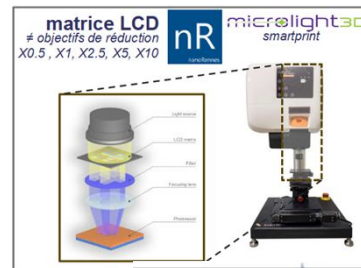
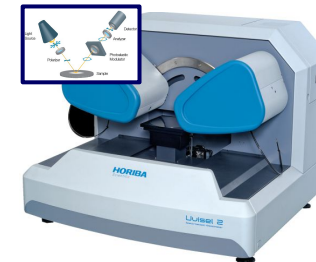
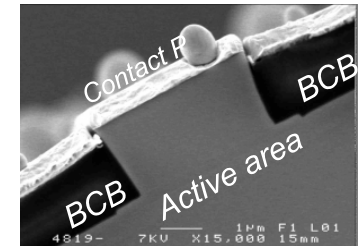


Image AFM d'une surface d'InP nanostructurée



Ellipsomètre Horiba UVSEL2

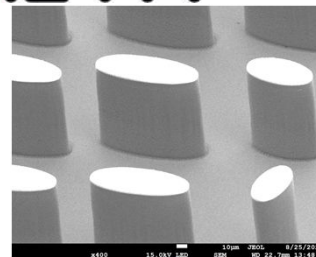


X-section du ridge d'un laser, nR/C. Levallois

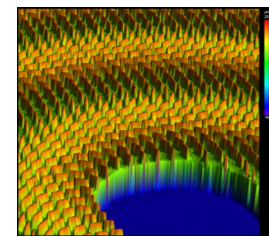
From the support



IETR

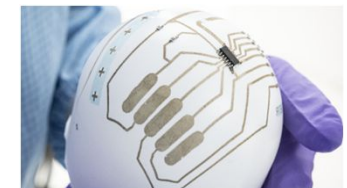
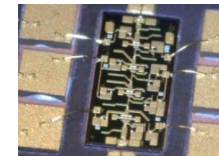


Piliers 100µm résines Su8
- PEPR Electronique - nR/D.Gonzales

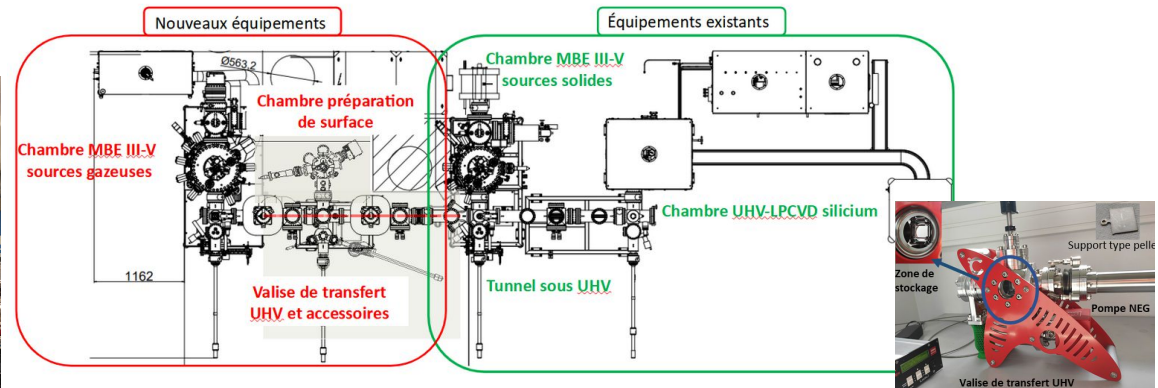
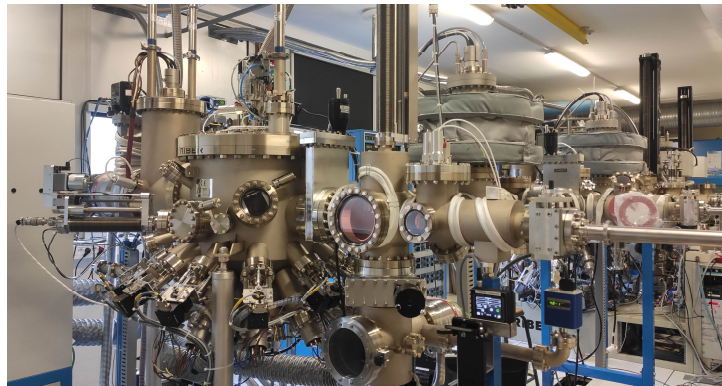


Scan 3D µscopie confocale
(Antennes à métasurfaces)
PEPR Electronique - nR/D. Gonzales

To the device



PCB sur objets 3D par hydroprinting
maturation SATT OV - nR/ M. Harnois



III-V /Si Epitaxial cluster (Equipex+ NANOFUTUR of RENATECH+ CNRS, CPER Mat & Trans, AES PIMENTS Rennes Métropole, DSG2 INSA/ministère Hydrogène, PEPR Electronique)

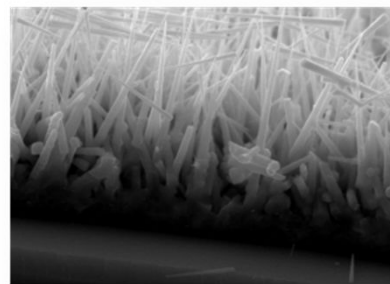
Epitaxial cluster for 3" inch samples with 2 MBE (gas & solid sources), UHV-LPCVD Si (As & B doping) with UHV transfer, UHV suitcase , chamber for surface preparation (before regrowth...)

LPCVD reactor poly-Si & SiN at 750°C

Si mono et polycristallin (n & p type doping), Si nanowires, III-V (InP & GaP & GaAs alloys, nanostructures) integrated on Si

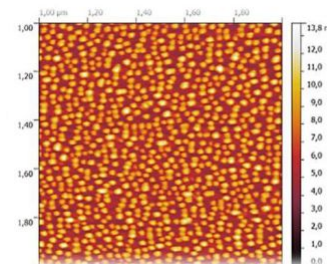


LPCVD reactor

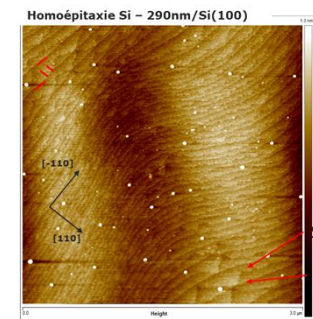


Nanofils de silicium

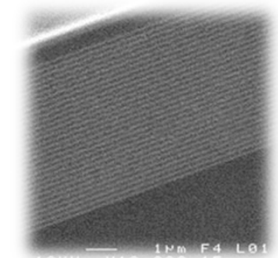
- Développement OASiS -nR/L. Pichon



Quantum dots

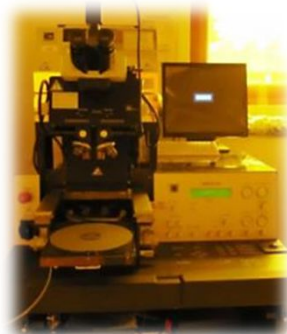


Si homoepitaxy



InP

Technological skills and facilities : lithography process



Mask aligner MA150

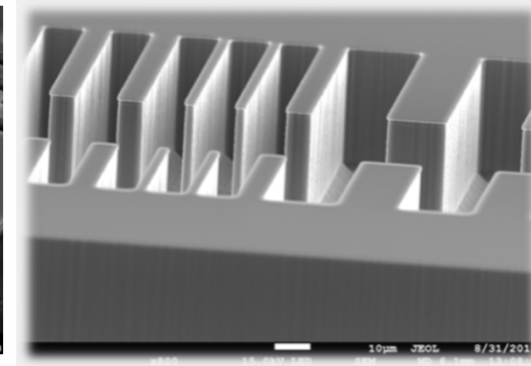
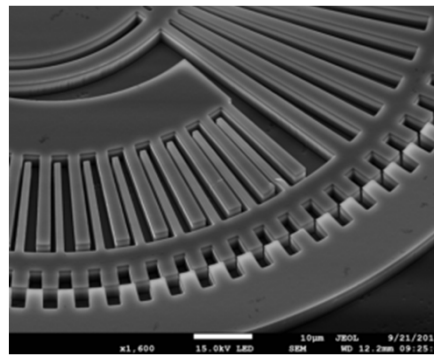
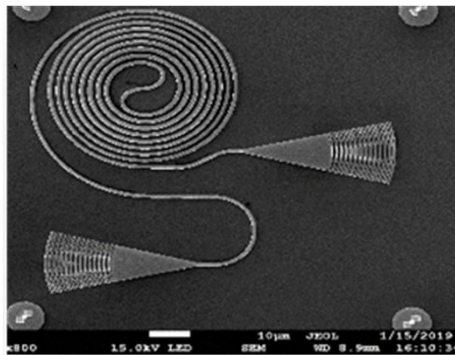


2 SEM FEG (Jeol & FEI) with e-beam module



UV lithography without mask (Microlight 3D)

- 3 UV mask aligners (Broad-band) et 1 deep-UV
- 2 Lithography e-beam
- 1 Lithography UV without mask
- Spin-coaters

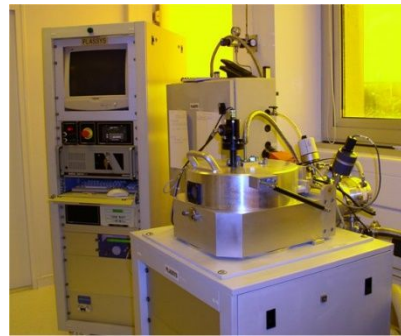


Examples of achievements

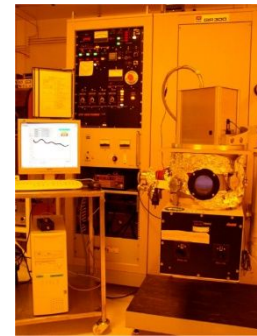
Technological skills and facilities : etching process



ICP-RIE (Corial)



RIE (Plassys)

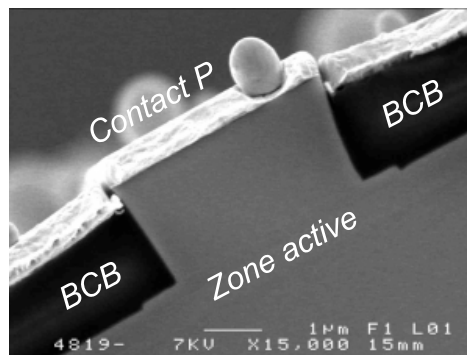


RIE (Alcatel)

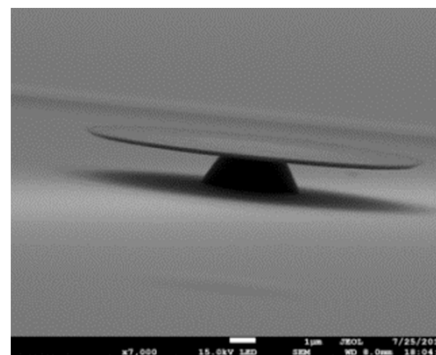


Extractor hood

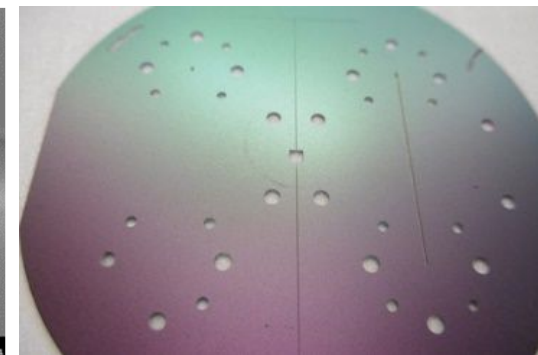
- ICP-RIE (Process BOSCH, Chlorine etching)
- RIE for Si material (fluorine chemistry)
- RIE for InP alloys (CH_4/H_2 chemistry)
- chemical etching



Cross-section of a laser ridge



Microdisk GaP on Si



Silicon deep etching with ICP-RIE

Technological skills and facilities : deposition



ICP-PECVD (Corial)



ebeam evaporator
(Alliance Concept)

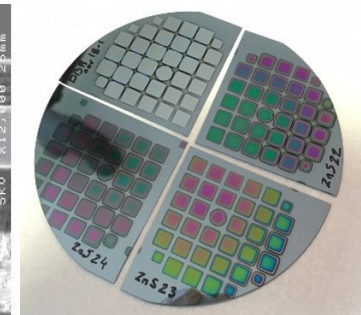
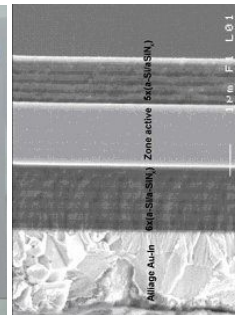
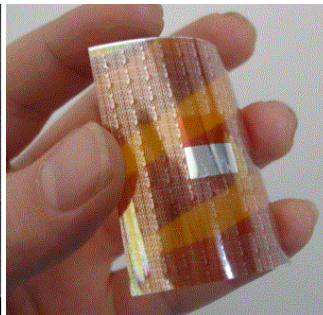
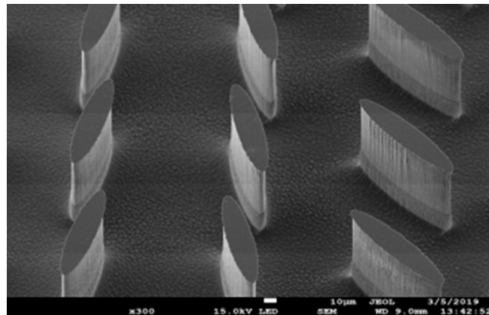


CCP-PECVD
(Corial)



Sputtering equipment
(Alcatel)

- ICP-PECVD, PECVD - aSi, SiO₂, Si₃N₄ (50-300°C)
- e-beam evaporation- Al, Ti, Cr, Ni, Cu, Ge, W, Pt, Au
- Sputtering technique - AlN, Al₂O₃, Si, SiN_x, ZnS, Ge, Ti et alliages, AuGe
- Oxydation ovens - SiO₂ thermique sur Si, with n & p type doping
- Cu electrodeposition process
- Printed electronics: Inkjet printing (metal, organic, inorganic compounds), serigraphy (dielectric/conductiv inks on various supports), transfer printing (on soft wafer...)





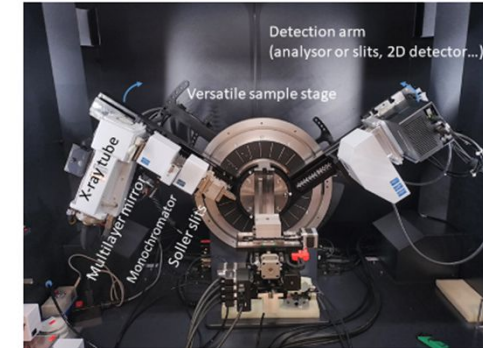
Point station in glove box



AFM Multimode 8

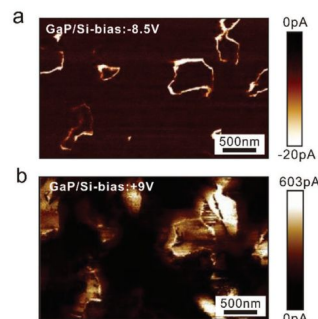


Ellipsomètre Horiba UVSEL2

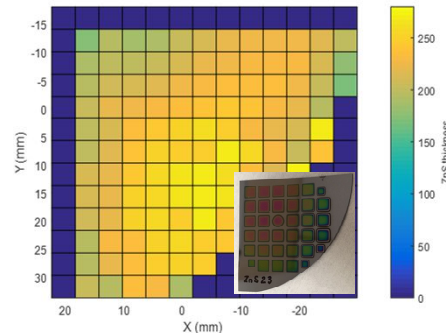


XRD equipment

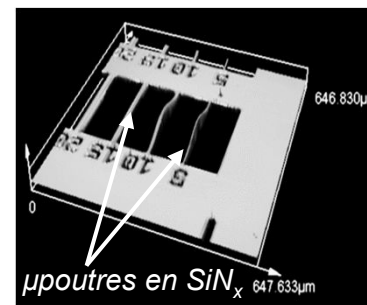
- *Point stations : Electrical measurements $I(V)$, $C(V)$, Hall effect, conductivity vs (T) , with solar simulator (LEDs)
- *AFM, profilometry, confocal microscope: measurements of thickness, roughness, 3D, stress,
- *Conductive-Tip AFM under N_2 atm.
- *Optical spectroscopy: ellipsometry $\lambda=200$ à $2000nm$, PL benches (VIS-IR)
- *Physico-chemical characterizations: XRD, rheometer, contact angle



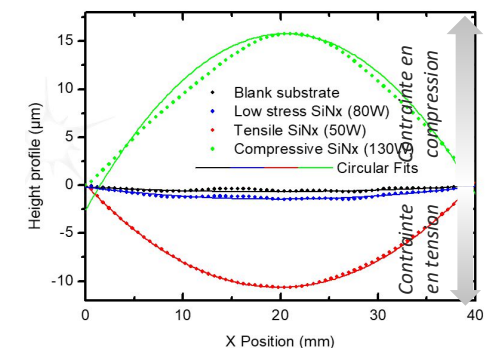
Conductive-tip AFM on GaP/Si



Thickness cartography of ZnS



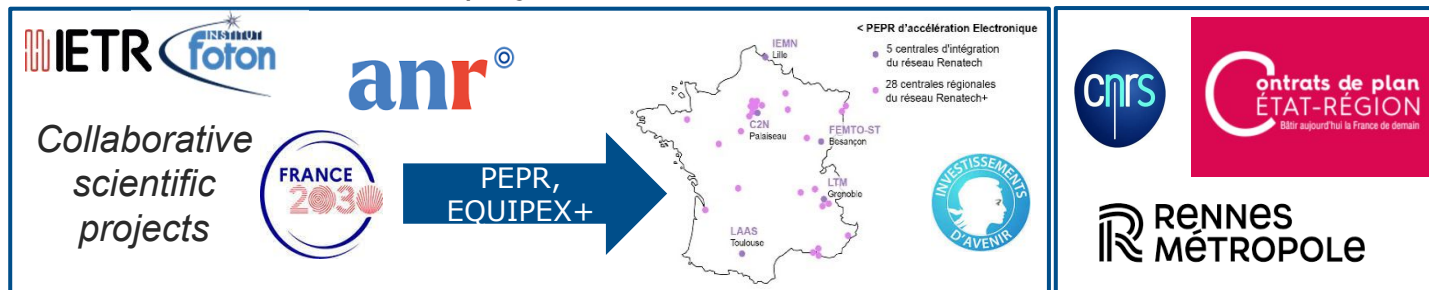
µpoutres en SiN_x (microscopie confocale)



Stress measurement of SiN_x layer

How to work together ? A project with nanoRennes?

Internal projects



Opportunity to access to state of art equipments & to micro-nanotechnologies know-hows ?

Exogeneous projects



➔ Now: <https://nano-rennes.insa-rennes.fr/>
Very soon: <https://nanorennnes.cnrs.fr/>

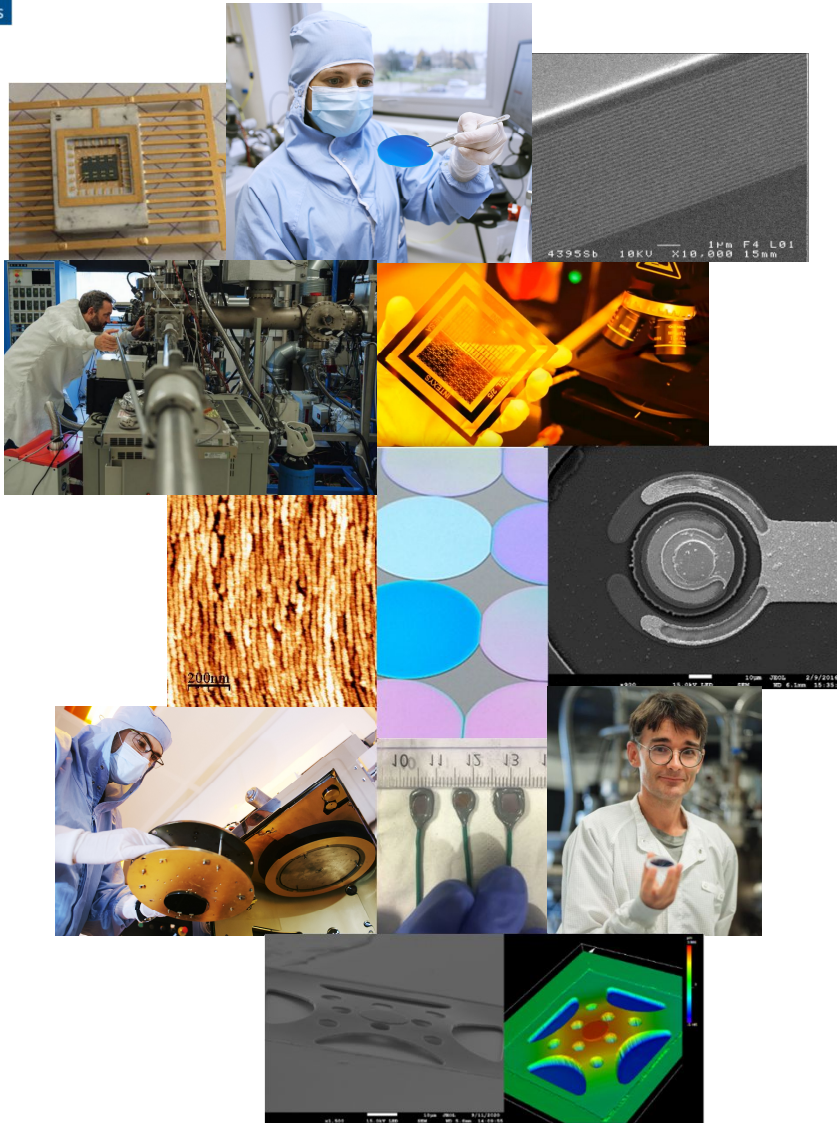
nanorennnes@services.cnrs.fr

➔ **Renatech**
website

<https://www.renatech.org/>



- *Description of the project
- *Quotation depending on the type of project :
 - collaborativ project
 - Request service for academics
 - Request service for a company



***Thank you
for your
attention***