International Scientific Network between France and Singapore Photovoltaics

P. Roca i Cabarrocas, CNRS/LPICM (France)
Subodh Mhaisalkar (NTU)

Ongoing joint activities & Cooperation opportunities

1. PV:

- Joint PhD between NTU and Ecole Polytechnique
- Common projects on perovskite solar cells
- IPVF projects
- …

2. Energy storage:

- Li-ion batteries at LPICM
- First contact with Ass. Prof. R.S. Rawat (NIE) on plasma processes for new materials (Nanowires)

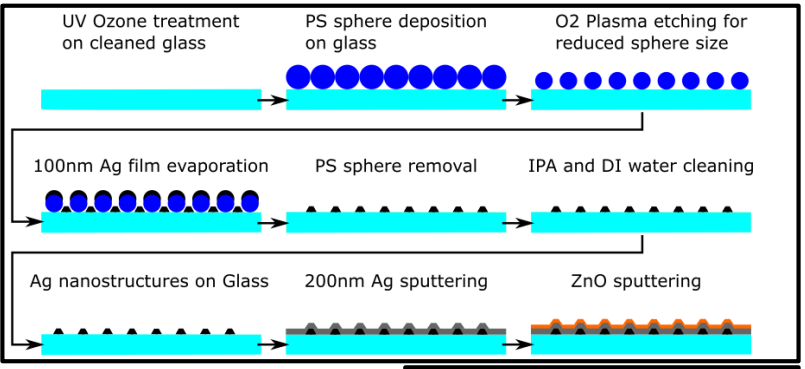
3. Green/Smart Buildings & cities

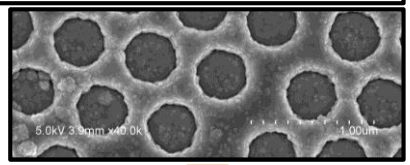
- Nanomaterials for Sensor applications

Nanostructured Back Reflectors for a:Si-H Thin Film Solar Cell by Polystyrene Sphere Assisted Lithography

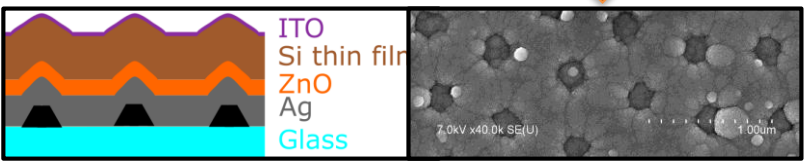
Li Zeyu [a,b,c]

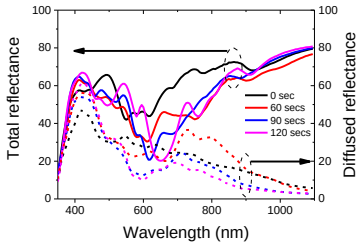
Supervised by: Associate Professor Rusli [a,b], Professor Pere Roca i Cabarrocas [c]

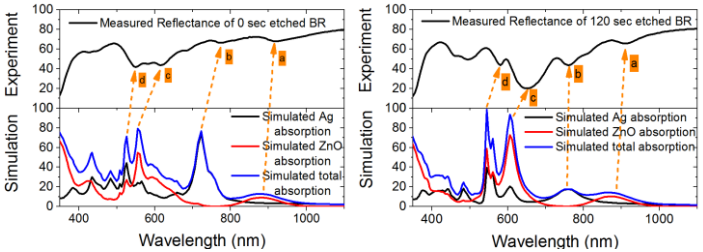




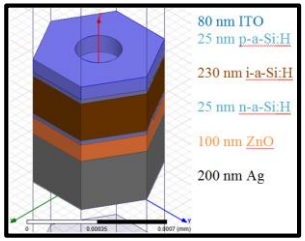
n-i-p silicon thin film solar cell fabrication by PECVD

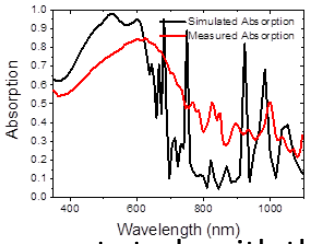


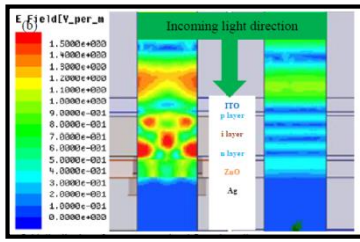




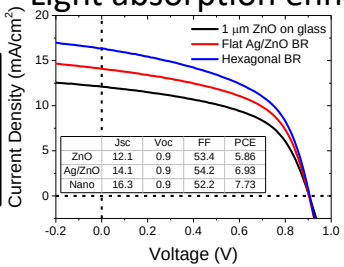
Optical study of the nanostructured back reflectors



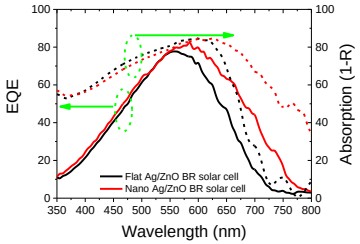




Light absorption enhancement study with the help of HFSS simulation



	Jsc	Voc	FF	PCE
ZnO	12.1	0.9	53.4	5.86
Ag/ZnO	14.1	0.9	54.2	6.93
Nano	16.3	0.9	52.2	7.73



Solar cell performance

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[c] **LPICM, CNRS, Ecole Polytechnique, Université Paris Saclay**, 91128, Palaiseau, France

PV Institutes in France

IPVF

L'Institut PhotoVoltaïque d'Ile-de-France

EDF TOTAL cnrs AIR LIQUIDE Creative Oxygen HORIBA JOBIN YVON RIBER

2. French Federation on PV

Gathering the main CNRS research labs on PV
Basis of the Scientific program of IPVF

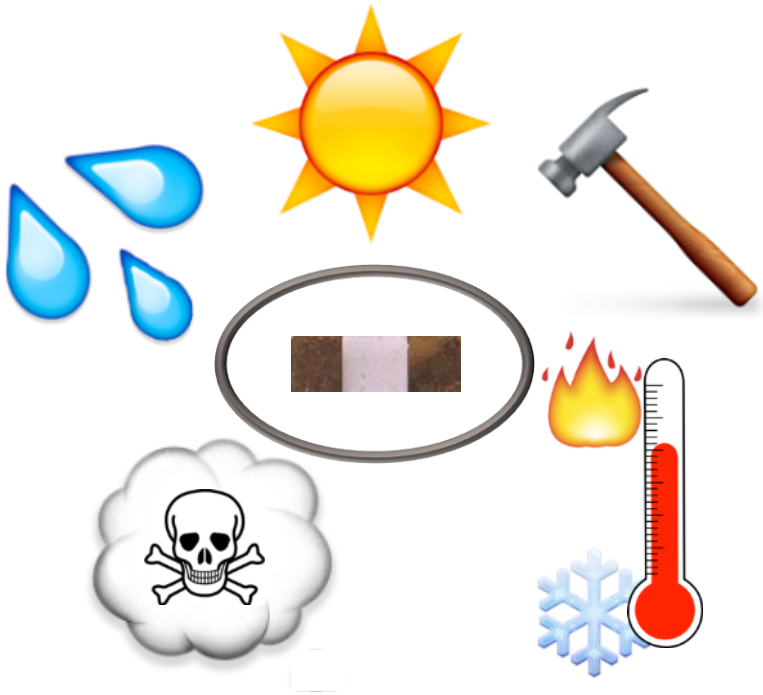
❑ Partner laboratories

- **IRDEP/Chimie ParisTech**
- **LPICM/Ecole Polytechnique**
- **ILV/UVSQ**
- **LPN/ C2N**
- **LGEP-Geeps/Supelec - CentraleSupelec, Univ. Paris XI et Paris 6**

- ICUBE, Université de Strasbourg
- FOTON, Rennes
- INL, Lyon
- IMN, Nantes
- IM2NP, Université Aix-Marseille
- ENS Cachan

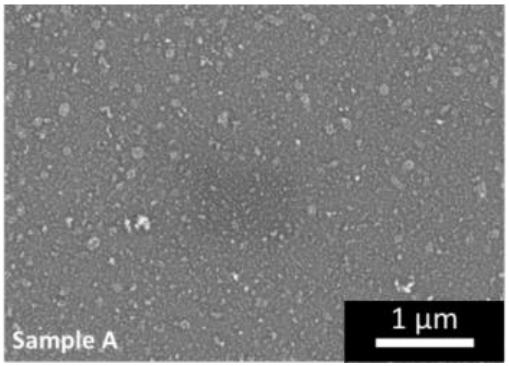
PLATINE: a platform dedicated to the reliability of nanosensors

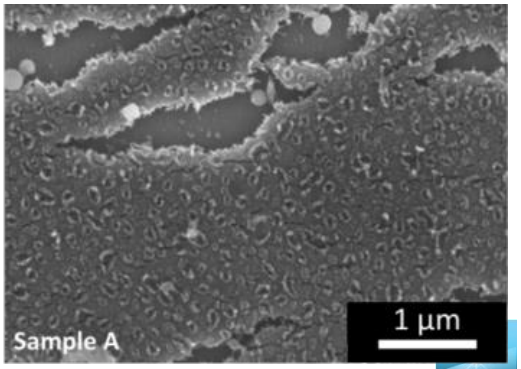
1. Fabricating nanosensors
in a cheap and reproducible way



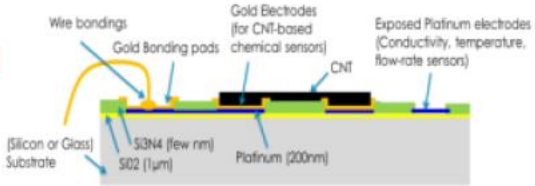
2. Simulating
real environmental conditions
in the laboratory

3. Analyzing ageing and
damage mechanisms



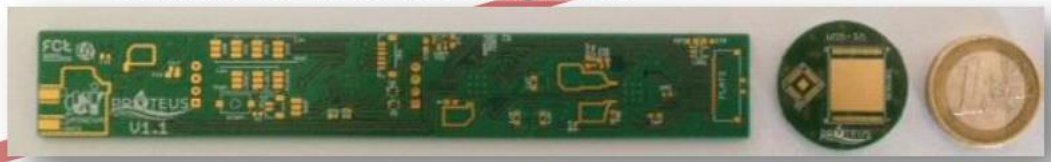


Water network monitoring with nano & micro enabled, autonomous sensor probes



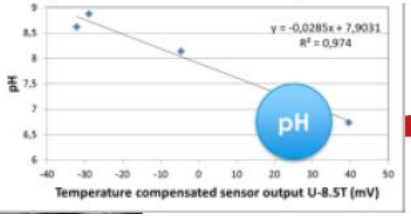
1. Massively multiplexed hetero-integrated micro & nano sensor chip

2. Autonomous, wireless, reconfigurable hardware and software for electronic integration



3. Assembly into water network-compatible sensor node

4. Deployment in Sense-City drink water loop



Green Smart Buildings & Cities

- **Sensors for roads, air and water monitoring**
  - Collaboration NTU (CINTRA, NEWWRI, ERIAN & IFSTTAR-LPICM (B. Lebental)
  - Plateform PLATINE at Ecole Polytechnique. Stress tests (thermal, electrical on sensors)
  - SenseCity. Test of Sensors in a climatic city

Anne Ruas

Berengère Lebental

Séverine Somma

SENSE-CITY