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# IEMN - Deposition Techniques in Clean Room

**Team:** Isabelle Roch-Jeune, Marc Dewitte, Carlos Moncasi-Luque, Chiara Crivello, David Guerin, Guillaume Cochez, Jérémie Chaillou

## SPUTTERING SYSTEMS

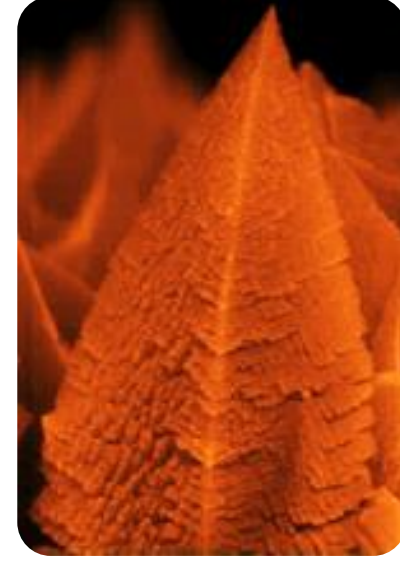
### ALLIANCE CONCEPT DP 650n°34

- 6 DC and RF cathodes 4"
- DC pulse and RF generators
- Au, Ni, Pt, WTi, Ta, NiCr, NiCu, Al, Mo, Cu, TaN, Si, SiO<sub>2</sub>, ...

800 °C

### 1 LEYBOLD Z550

- 1 cathode 6" and 4 cathodes 4" RF and DC
- Magnetic layer deposition
- TbFe<sub>2</sub>, TbCo<sub>2</sub>, TbFeCo, FeCo, Fe, Co, CoPt, FePt, Ta, Cr



VN Sputtering 550 °C

### 1 ALLIANCE CONCEPT CT 200 CLUSTER

- 3 chambers, 14 targets (2" confocal, 4" planar), fully automated
- Different RF and DC pulse generators
- Single or multi-layers processes, reactive sputtering, co-sputtering, substrate bias.
- Realization of complex structures without vacuum break and cross-contamination of chambers

Ch. 1 & 2 → Metals & Nitrides (Fe, Co, Pt, VN, ...)

Ch. 3 → Metals, Nitrides & Oxides (W, WN, TiN, Ta<sub>2</sub>O<sub>5</sub>, ZnO, ITO, ...)

### 1 ELETTRORAVA NEW!

- 12 targets 4" confocal, fully automated, RF, DC, HiPIMS, bias.
- Single or multi-layers processes, reactive sputtering, co-(tri-)sputtering, substrate holder with planetary rotation

800 °C

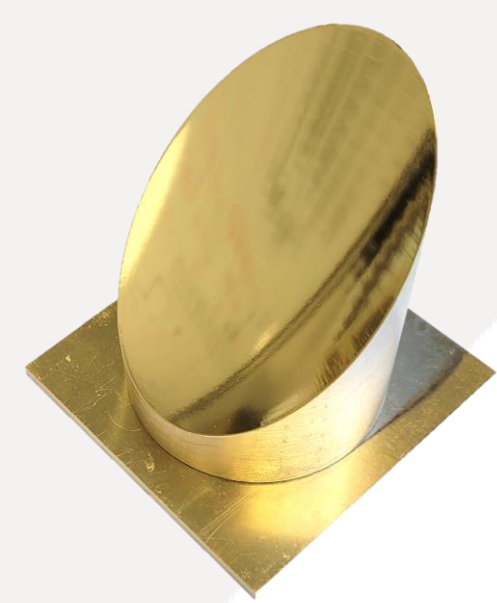
## ELECTRON BEAM

### 1 PLASSYS MEB 450S

- Load lock
- Substrate holder 4"
- 3 sources: In, Cr, Au
- Substrate holder with planetary rotation

### 2 PLASSYS MEB 550S

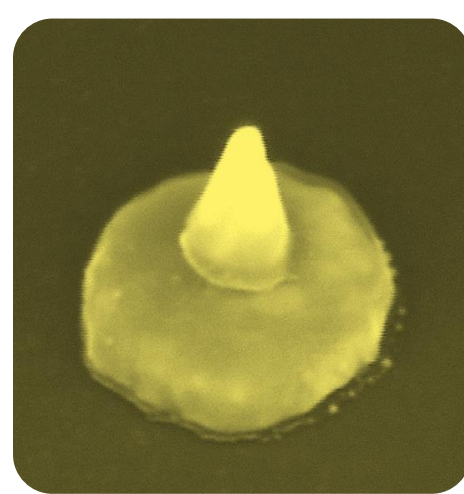
- Load lock with ion beam source
- Capacity : 4 substrate holders 4"
- Au, Ti, Ge, Al, Pt, Ni, Mo, Cr, Pd, Ag



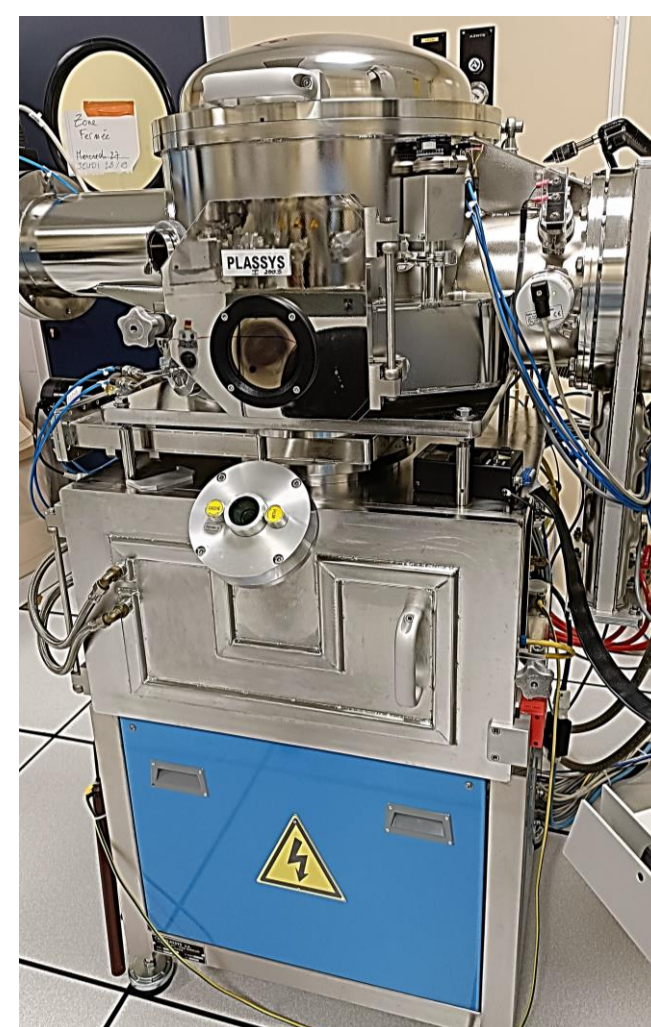
Mirror covered with Au

### 1 PLASSYS MEB 550SL

- Load lock with O<sub>2</sub> treatment
- Ion beam in chamber
- Substrate holder 6"
- Ti, Ni, Cr, Al, Au, Pt, Pd, Ge



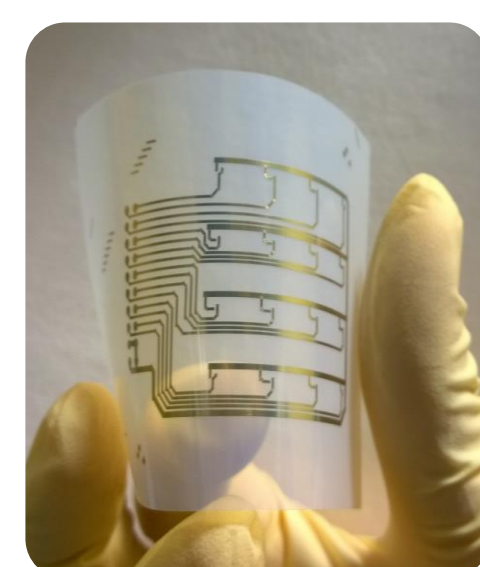
Cr/Au Nanoprobe



## INKJET PRINTING

### CERADROP X-SERIES INKJET PRINTER

- 2 Dimatix Printhead (128 Nozzles each, Ø35 µm)
- 1 Mono nozzle print-head
- Diameter of Nozzle 20, 30, or 35 µm
- 1 IR Dryer
- Printing with AgNPs ink and carbon ink

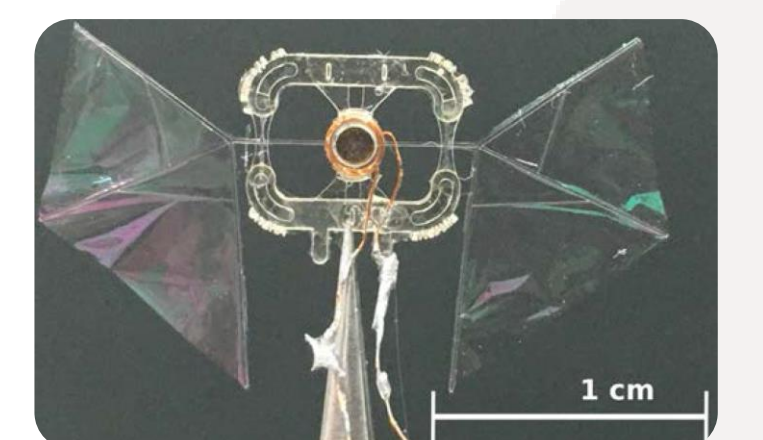


Ag circuit printed on PET

## PARYLENE

### COMELEC C20S

- Room temperature deposition (3 steps):
- Vaporization of the solid dimer
- Pyrolysis of the dimer to yield the monomeric diradical
- Simultaneous adsorption and polymerization of the monomer on the substrate (at room temperature)
- Thickness ranging from 30 nm to 50 µm



OVMI-Parylene



## FURNACES

### RAPID WAFER HEATING SYSTEM JIPELEC JETFIRST 200

Gas process : N<sub>2</sub> - N<sub>2</sub>/5%H<sub>2</sub> - O<sub>2</sub> - Ar

100 – 1100 °C



### ATMOSPHERIC PRESSURE TUBULAR ANNEALING FURNACES CARBOLITE

Gas process : N<sub>2</sub> - N<sub>2</sub>/5%H<sub>2</sub>

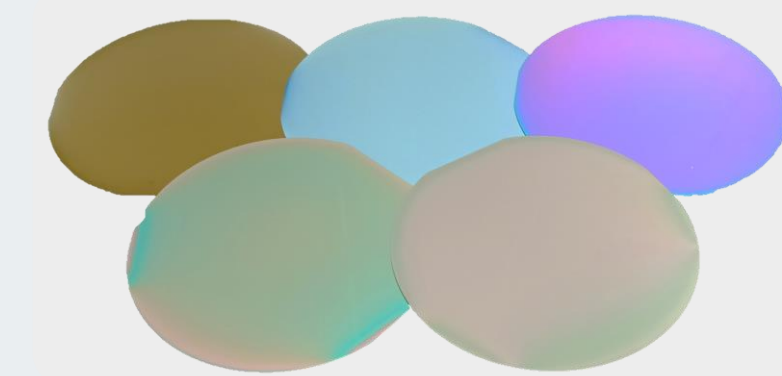
100 – 1000 °C

## PE-CVD

### OXFORD PLASMALAB 80 PLUS

- Substrate holder of 8"
- HF 13.56 MHz and BF 50 to 400 KHz
- Gas: 5%SiH<sub>4</sub>/N<sub>2</sub> - NH<sub>3</sub> - N<sub>2</sub>O - N<sub>2</sub> - He, and CF<sub>4</sub>/20%O<sub>2</sub> - O<sub>2</sub>
- Deposition rate: 100 – 700 Å/mn
- SiO<sub>2</sub>, SiO<sub>x</sub>N<sub>y</sub>, Si<sub>3</sub>N<sub>4</sub>

100 – 340 °C



Si<sub>3</sub>N<sub>4</sub> at 300 °C different thicknesses



## AP-CVD & LP-CVD

### 2 AP-CVD TEMPRESS FURNACES

- Tubes for thermal oxidations of silicon wafers up to 1100 °C
- Thickness: from 2 nm up to 2 µm



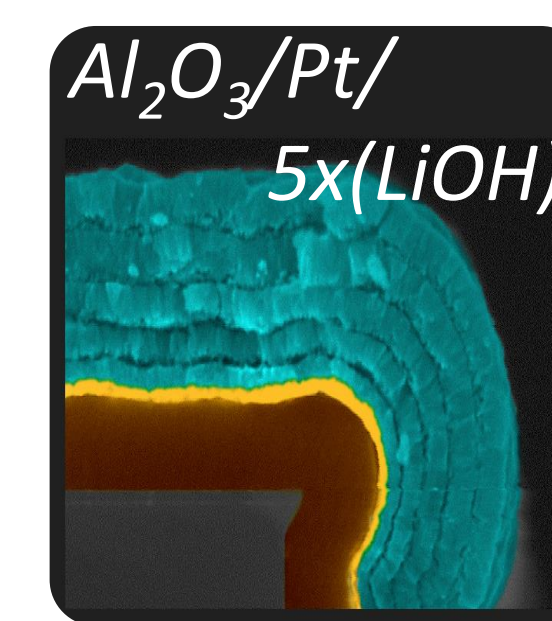
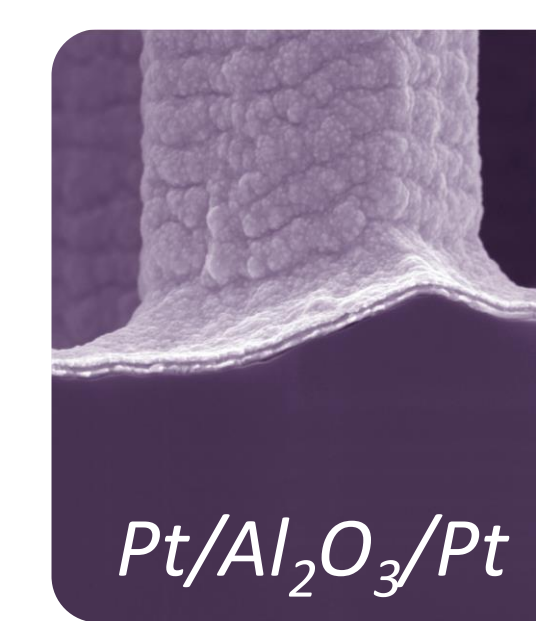
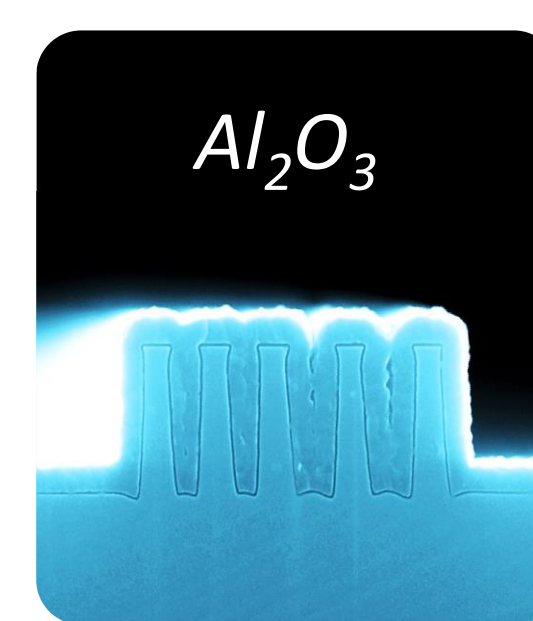
### 3 DEDICATED LP-CVD TUBES

- Poly Si (≤ 600°C) and in-situ P doped poly Si – thickness up to 2 µm 650 to 750 °C
- LTO, BSG LTO, PSG LTO or BPSG LTO - thickness up to 5 µm 420 °C
- Low stress Si<sub>x</sub>N<sub>y</sub> or stoichiometric Si<sub>3</sub>N<sub>4</sub> - thickness up to 1 µm 800 °C
- Gas: O<sub>2</sub>, H<sub>2</sub>, SiH<sub>4</sub>, PH<sub>3</sub>, BCl<sub>3</sub>, SiH<sub>2</sub>Cl<sub>2</sub>, NH<sub>3</sub>, N<sub>2</sub>, Ar

## ALD

### 2 ALD PICOSUN - R200 ADVANCED

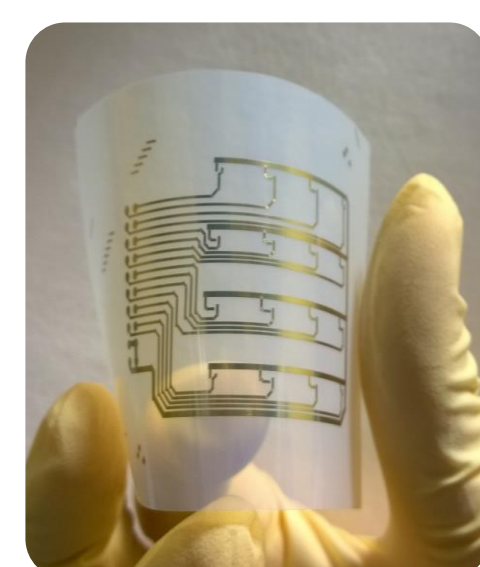
- Through-porous and HAR samples
- Precursors : 2 or 3 liquid sources, 3 solid sources, 5 gases for plasma, ozone
- 2 process chambers 50 - 500 °C
- 1 mono layer growth control
- 2 glove boxes (N<sub>2</sub>, Ar)
- 1 ellipsometer *in-situ*
- Al<sub>2</sub>O<sub>3</sub>, NiO, TiO<sub>2</sub>, ZnO, MnO<sub>2</sub>, Ag, Pt, LiOH, ...



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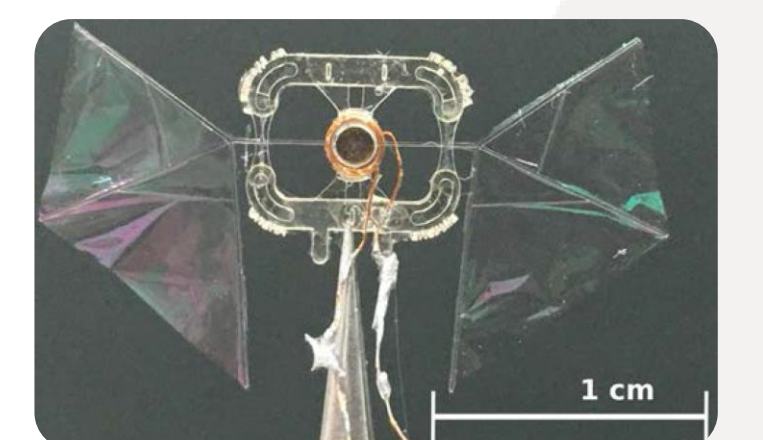


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