

# MOCA: Couches minces diélectriques MONOCristallines pour CAPACITÉS intégrées

## Programme P2N 2010



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## Motivations

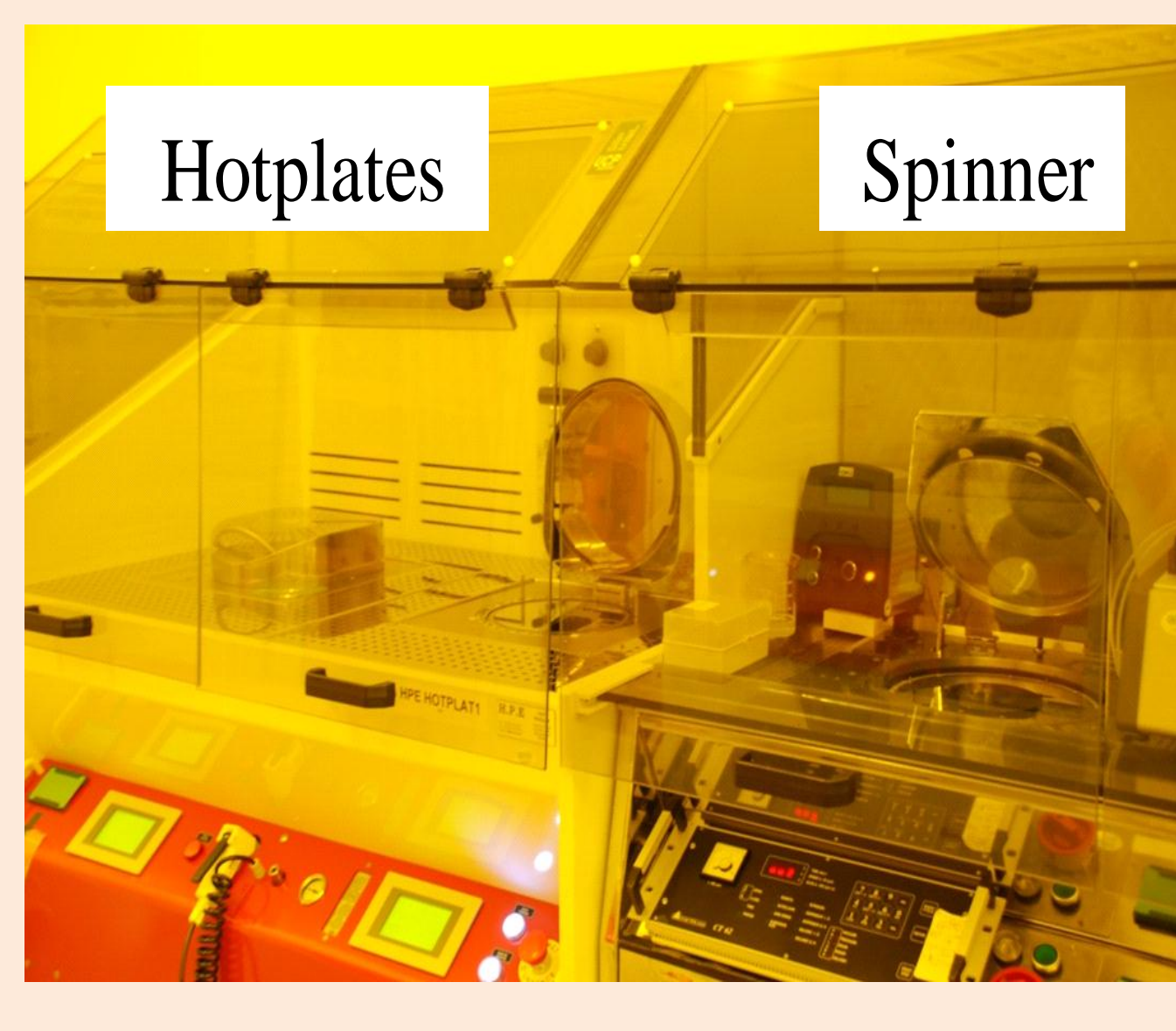
The MOCA project aims to provide a technological breakthrough by improving the quality growth of thin films of perovskite-like materials on silicon wafers by a bottom-up approach (epitaxy). Through this approach, ultimate behaviours affordable by these films are expected making these optimized systems very useful in applications such as acoustic resonators, high-K capacitors or piezoelectric actuators.

## Deposition of the active layer

### Fabrication process

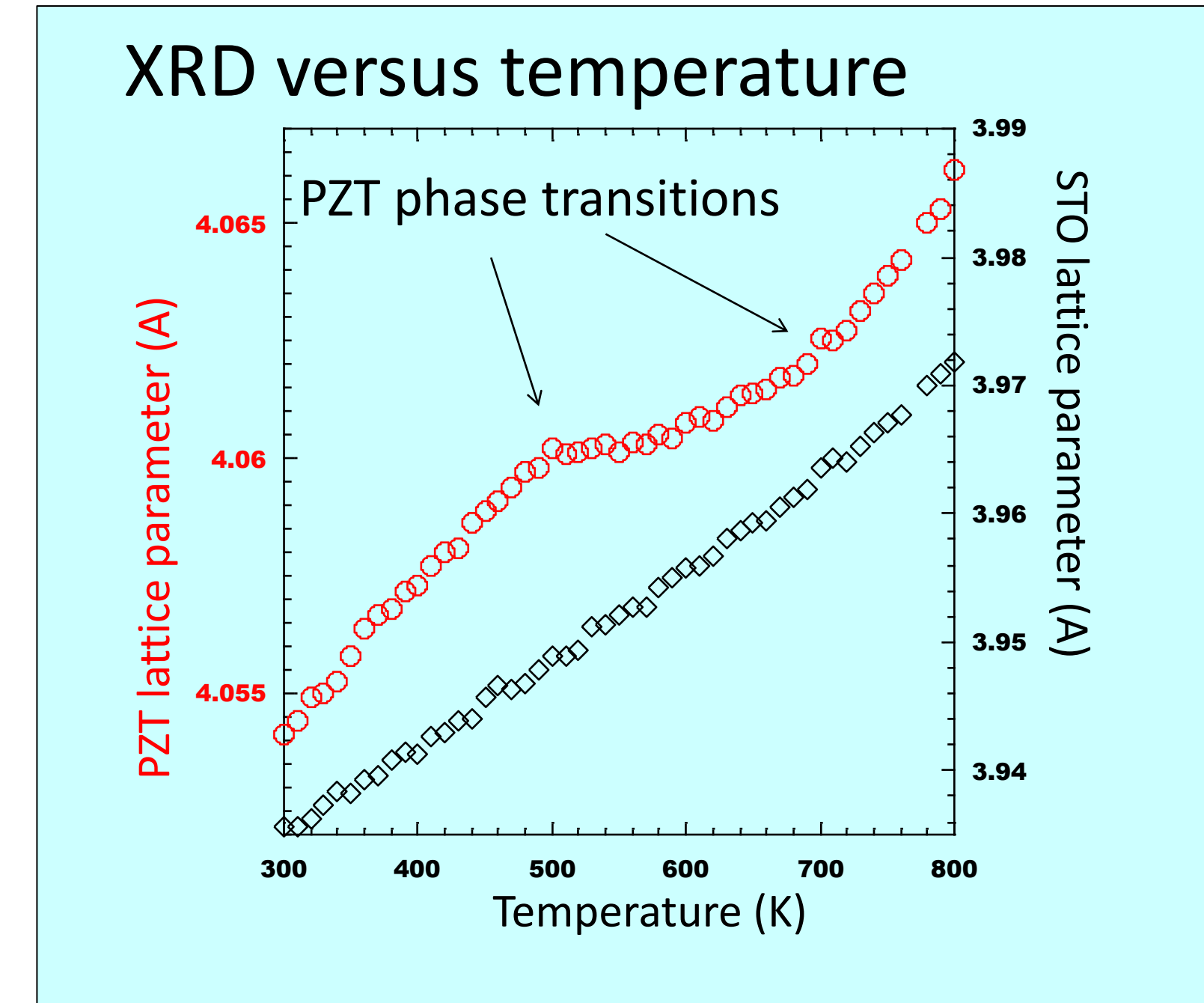
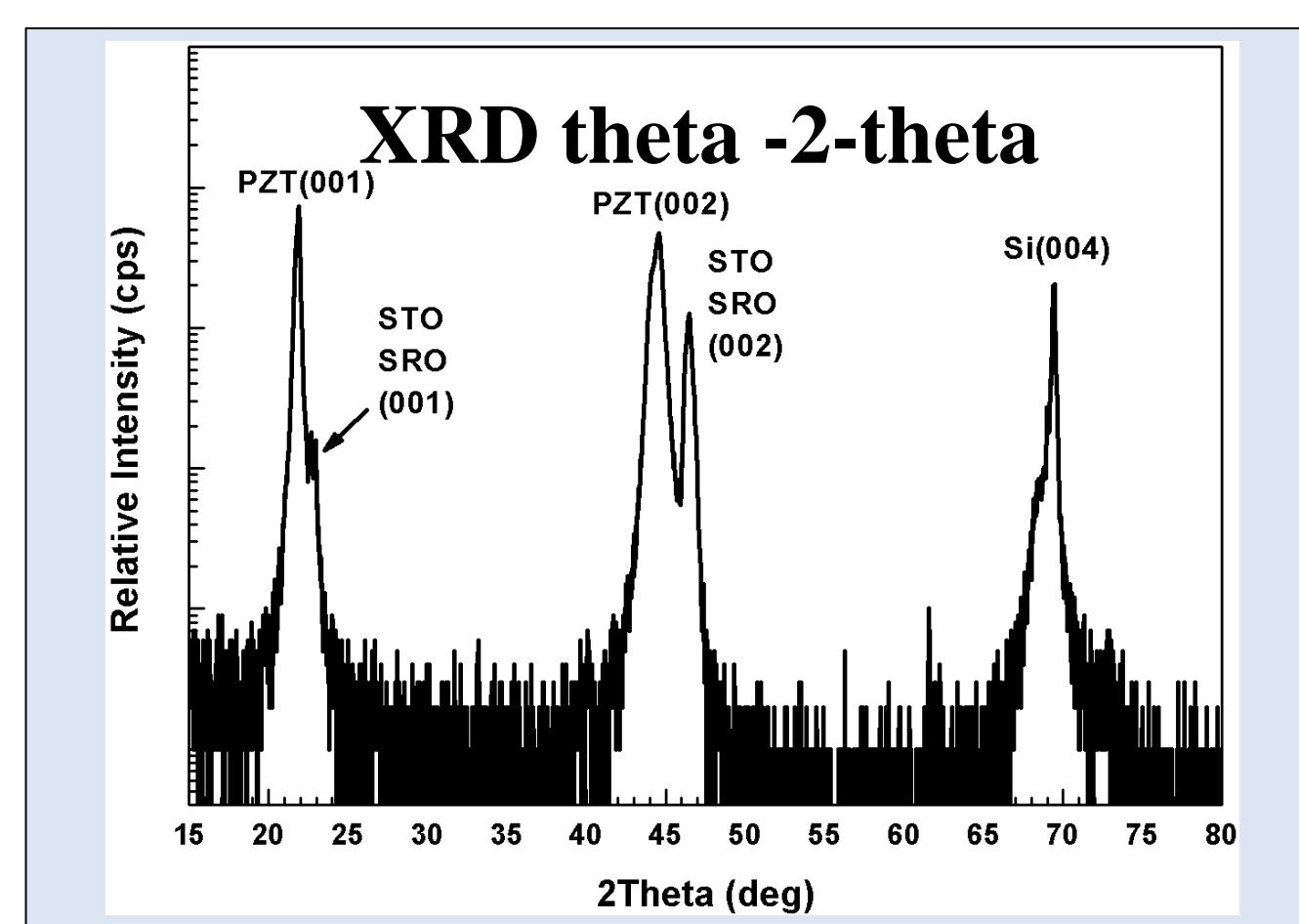
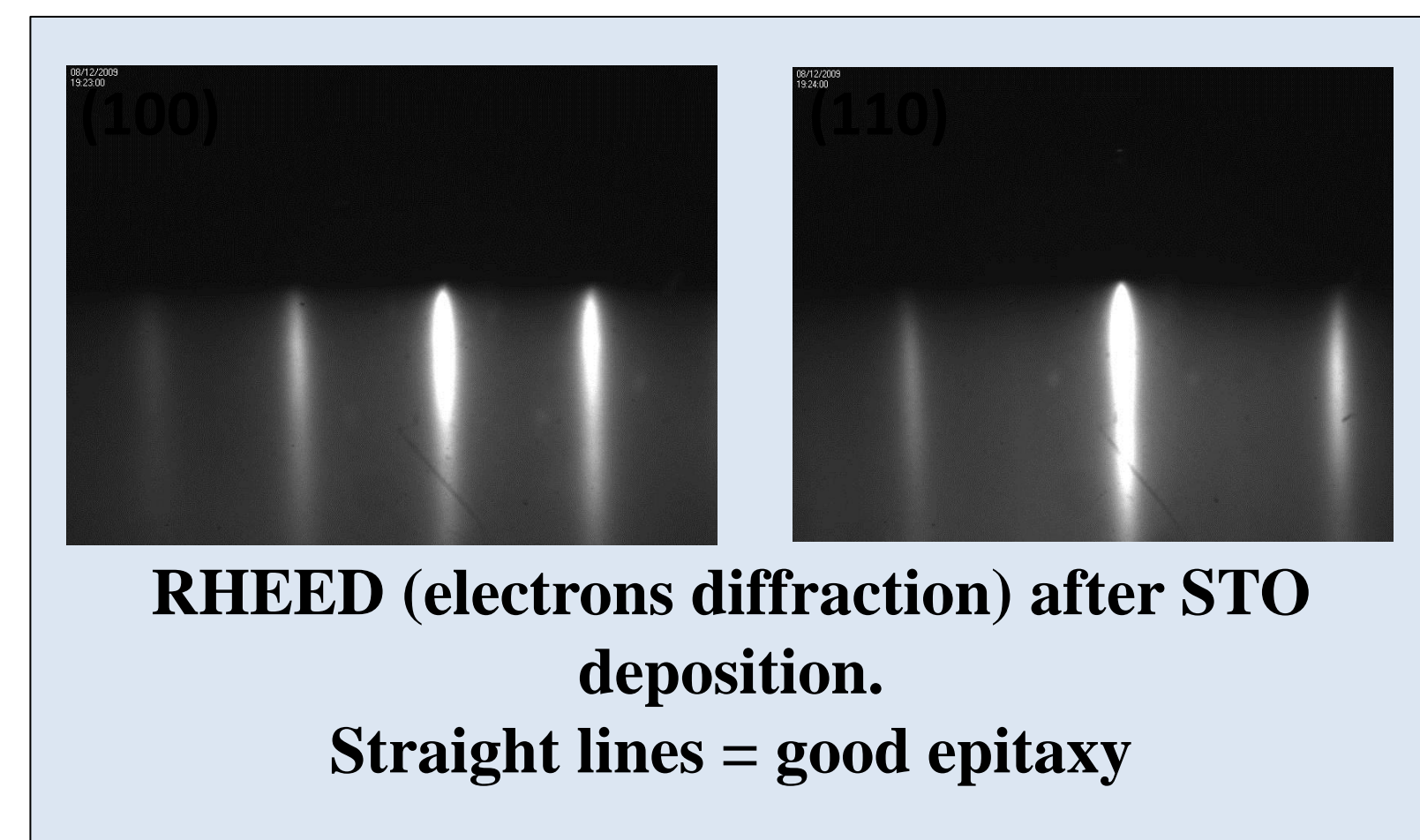
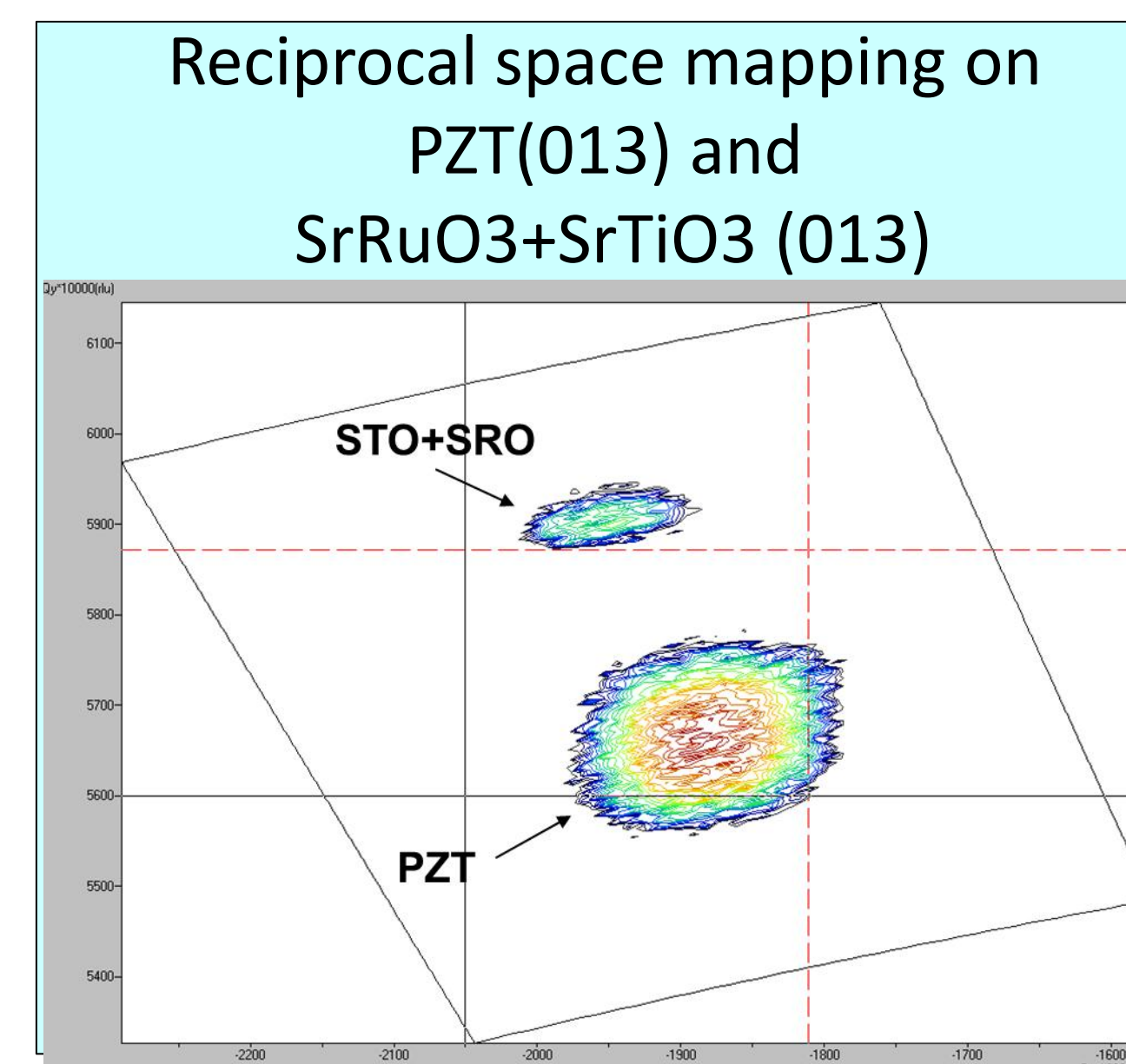
1.  $\text{SrTiO}_3$   
➢ MBE - INL, France
2.  $\text{SrRuO}_3$   
➢ PLD - NIMP Institute, Romania
3.  $\text{PZT}(52:48)$   
➢ Sol-gel - LETI, France

### Sol gel technique



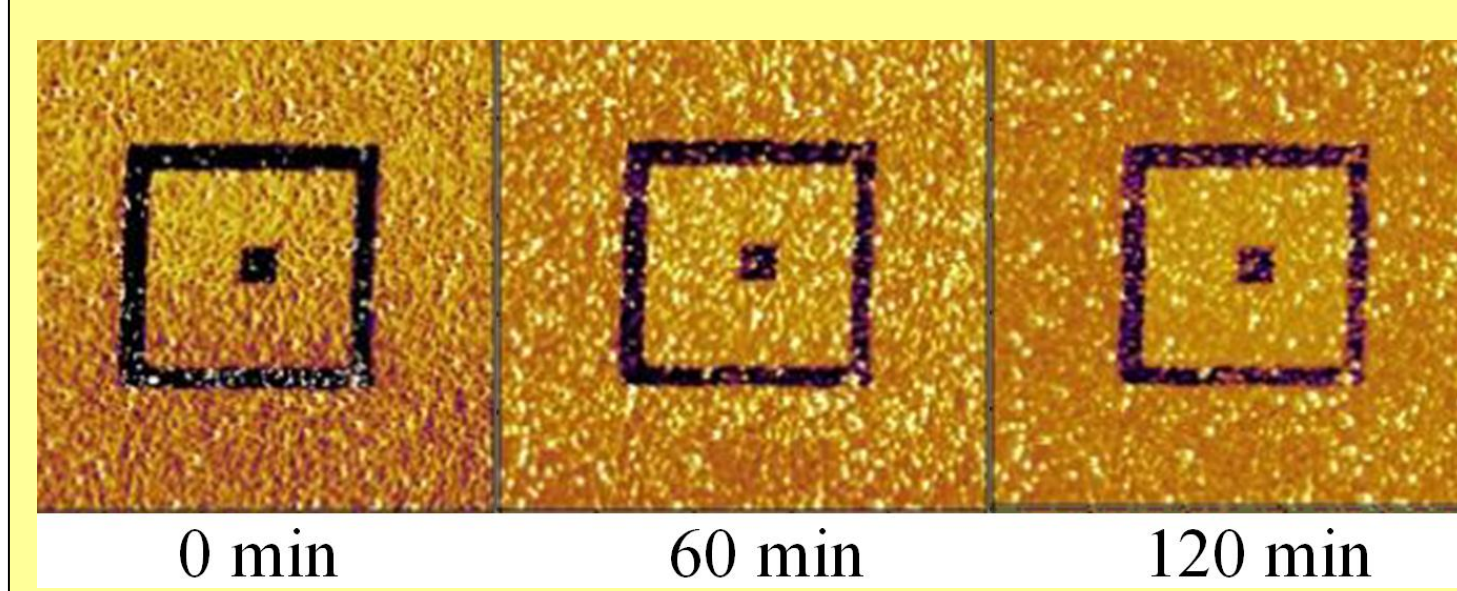
PZT ~ 250 nm
SRO ~ 22.9 nm
STO ~ 24.9 nm
Si ~ 300 μm
Stack

## Structural characterization

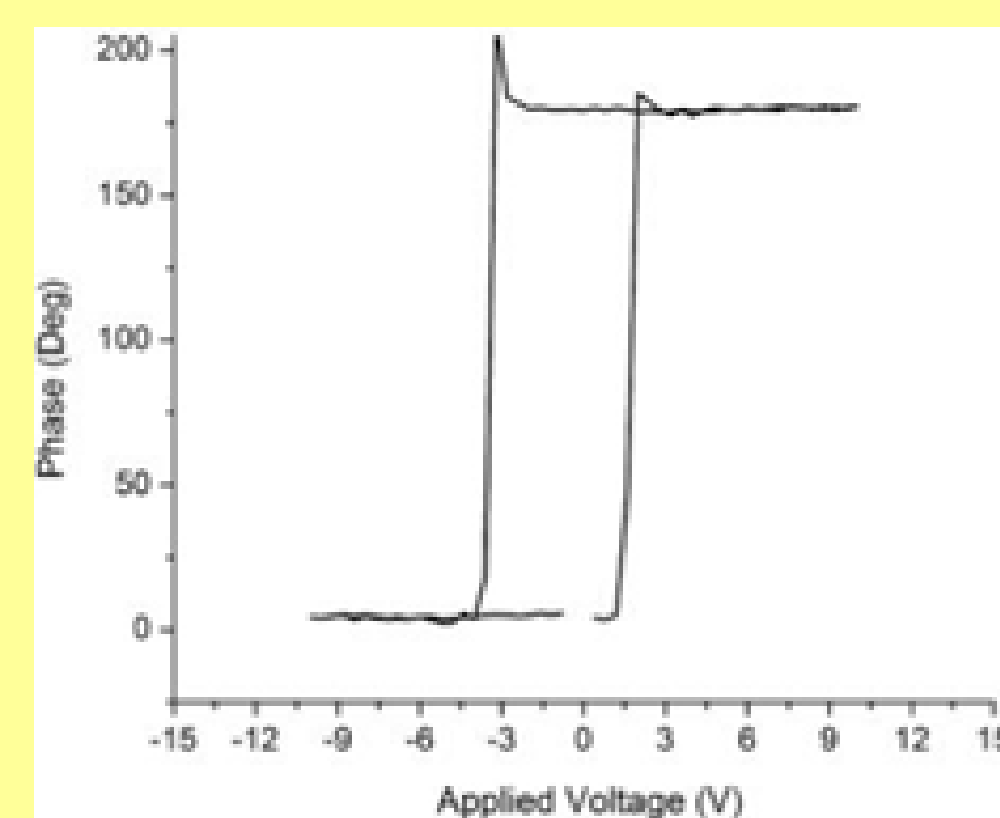


## Electrical Characterization

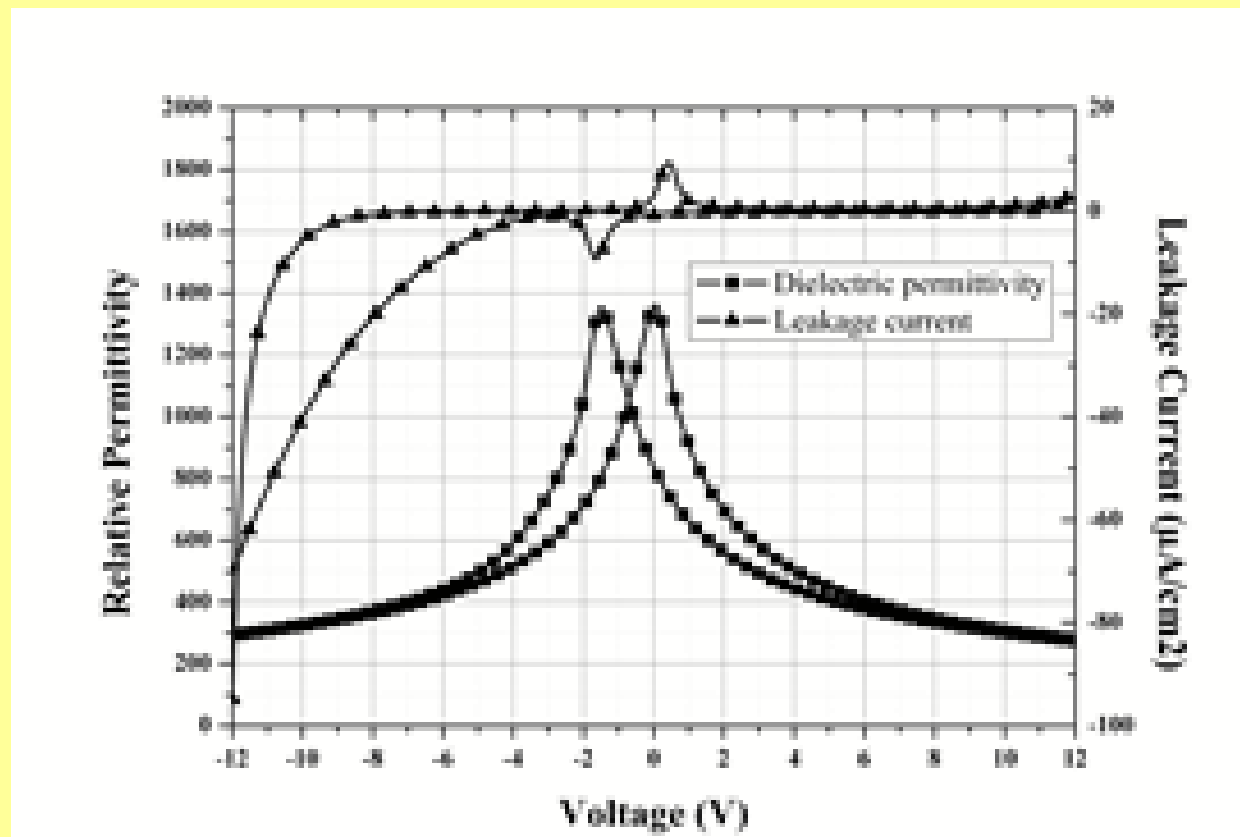
### Ferroelectric retention vs time



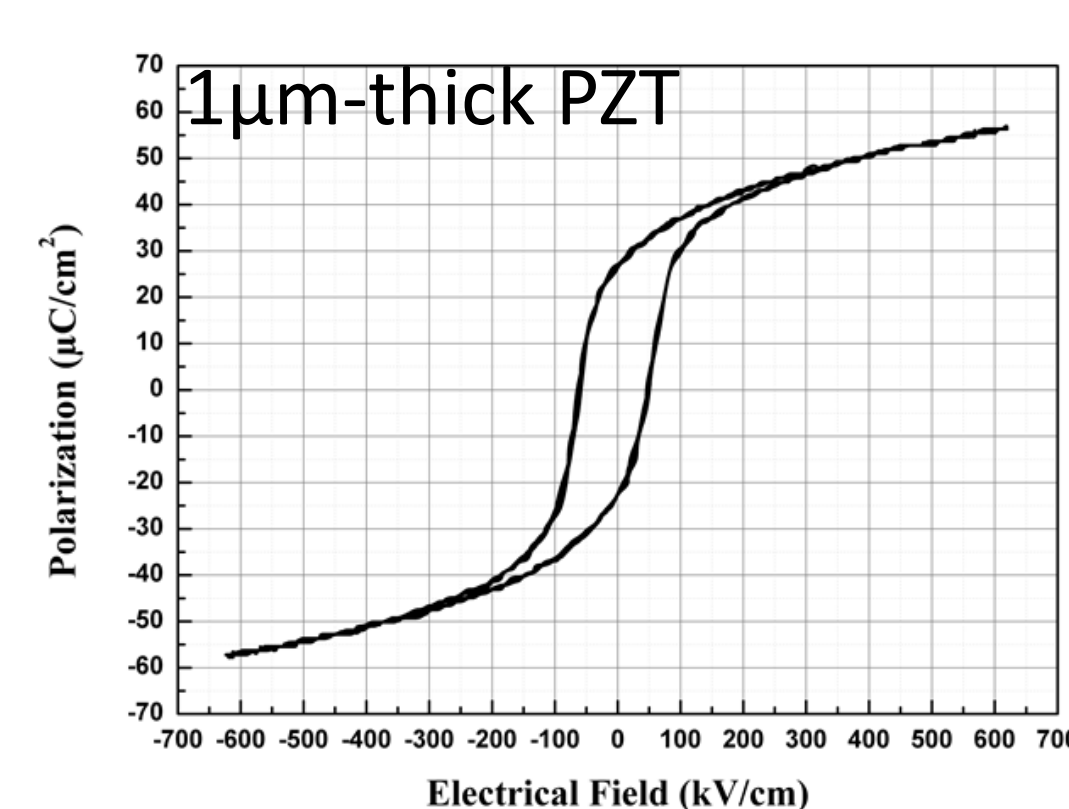
### Piezoelectric AFM



### Dielectric constant and I-V curves



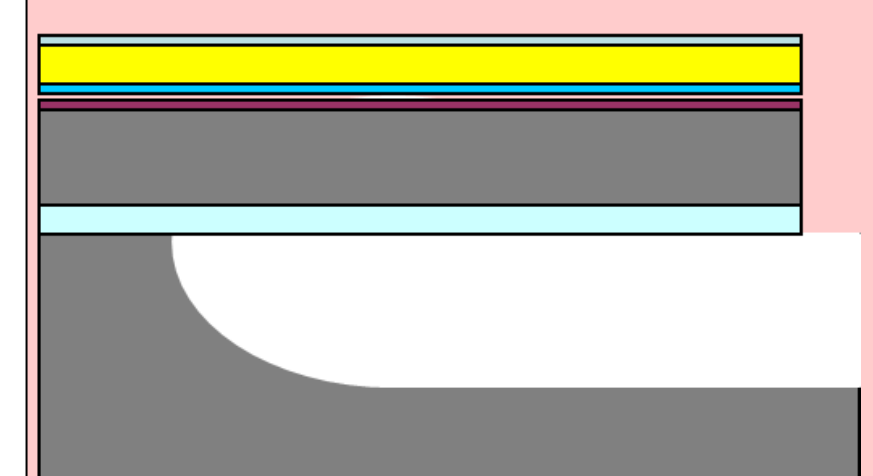
### Polarisation versus field



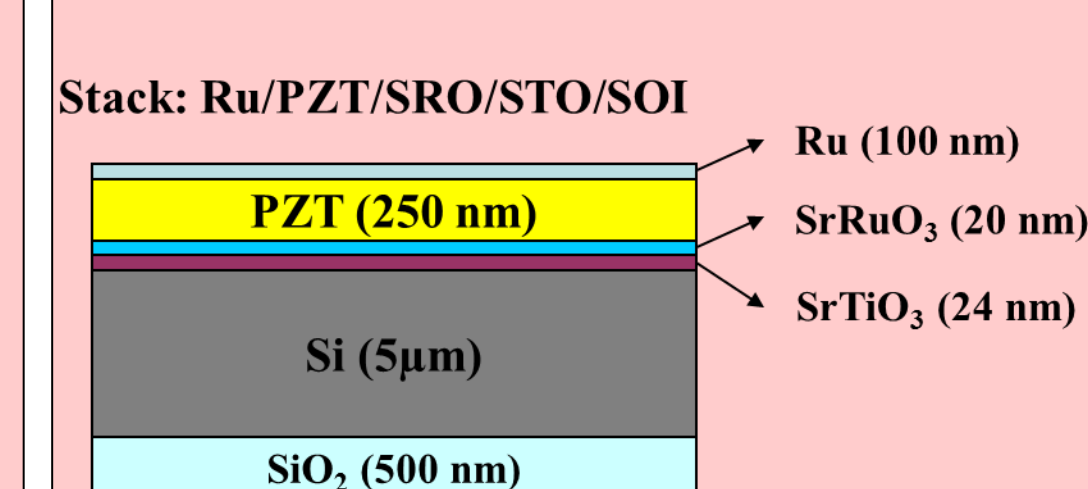
## Proof of concept

### Single crystal cantilevers

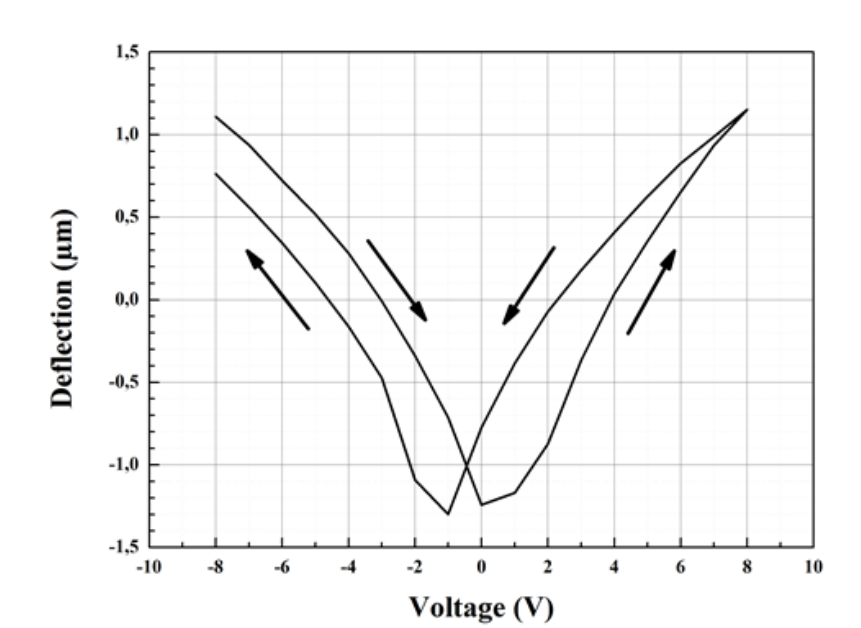
#### Cantilever with PZT epi-film



#### Stack



#### Deflection



### Resonators

- FEM modelization of electrostrictive effect on SAW
- First experimental proof of concept on STO single crystal

## Production scientifique

Thin solid films 2012 – Yin Shi / Ultrasonics 2012 – E. Defay/ ISAF 2012 – Yin Shi / APL 2012 (under review) – B. Dkhil - ROCAM 2012 – G. Le Rhun (invited talk) - E-MRS 2011 – Yin Shi

### CONTACT :

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