

Laboratoire CRISMAT

UMR6508, CNRS et ENSICAEN

Caen

- ~ 70 permanent staff, ~110 persons in total
Director: Wilfrid Prellier

Links with Energy:
Superconductivity
Thermoelectricity
Multiferroics
Batteries
Ionic conductors
Magnetocalorics

- **Areas of expertise of the lab**

Cristallographie et Physique de la Matière
Matériaux et Energie
Films, Interfaces, Surfaces
Matériaux et Procédés

- CNRS: sections 15 et 3 / CNU: sections 33 et 28
GDR Meeticc, Oxyfun, ALMA, GIS Thermoélectricité, RS2E

Labex EMC3 (Energy Materials and Clean Combustion Center)
Institut Carnot ESP (Energie et Systèmes de Propulsion)



N A M e

GDR Nanomaterials for Energy Applications

ELABORATION
MEASUREMENTS & METROLOGY
SIMULATIONS & THEORY
APPLICATIONS



Laboratoire CRISMAT

UMR6508, CNRS et ENSICAEN

Caen

- Axes thématiques du GDR : Elaboration + Mesures des propriétés
 - ~ 10 persons involved in the GDR:

Thin films elaboration

Christophe Cibert, Adrian David, Arnaud Fouchet, Rosine Germanicus, Ulrike Lüders, Gilles Poullain, Wilfrid Prellier, Antoine Ruyter

Thermoelectric measurements

Ramzy Daou, Sylvie Hébert



GDR Nanomaterials for Energy Applications

ELABORATION
MEASUREMENTS & METROLOGY
SIMULATIONS & THEORY
APPLICATIONS



Thin film activities at the CRISMAT

Deposition of thin films

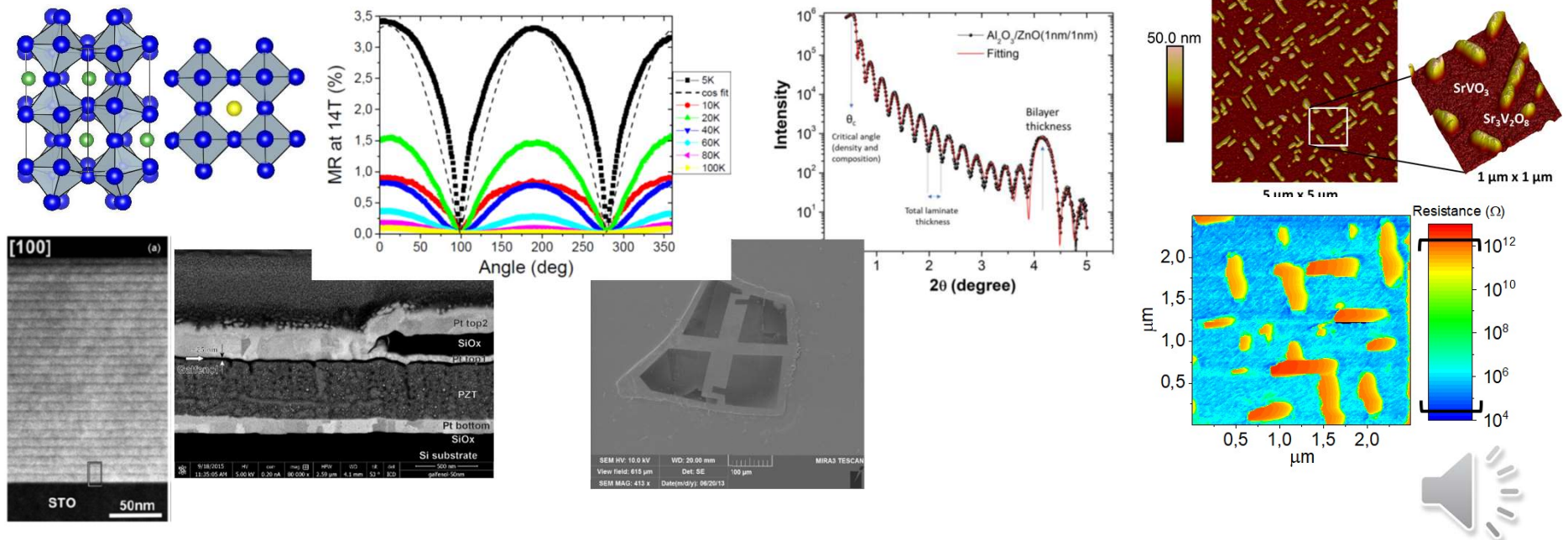
- Thin films, heterostructures, superlattices, laminates
- Complex oxides (perovskites ...), binary oxides, some metals by PLD, sputtering, evaporation
- Integration of crystalline oxides on Si, glass, polycrystalline substrates

Characterization

- Structure: XRD, GIXRD, XRR, EBSD ...
- Physical properties: magnetism, conduction, dielectric properties, ...
- Optical and e-beam lithography for (sub-)micrometric test structures

Atomic Force Microscopy

- Ambient AFM and at low pressure/low temperature
- Local electrical properties
- Local mechanical properties
- Local magnetic/ferroelectric properties



Thermoelectric materials

Synthesis and structural characterization of thermoelectric materials

(F. Gascoin, E. Guilmeau, A. Maignan, O. Lebedev, D. Pelloquin)

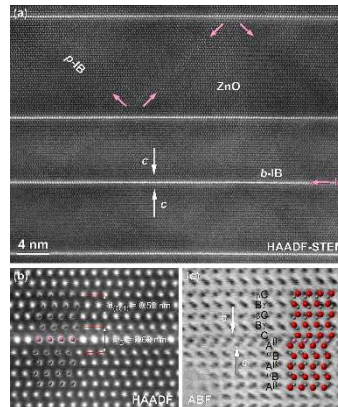
Mostly oxides, sulfides and selenides

Intermetallics

Bulk materials and single crystals

SPS sintering

Mechanical alloying



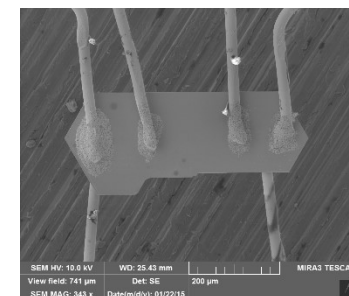
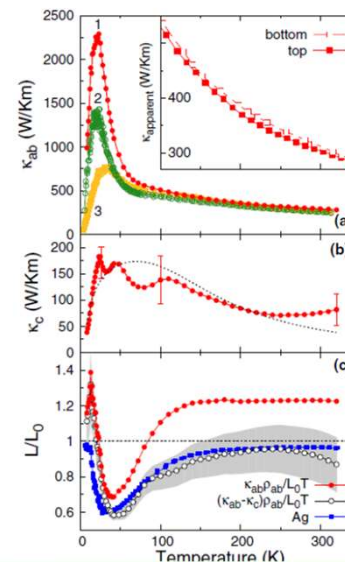
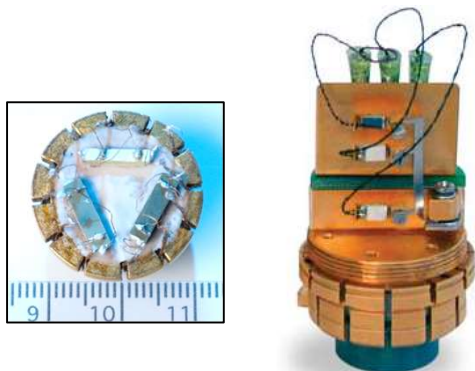
X-Ray diffraction +
High resolution
transmission electron microscopy
(HAADF, EDX)

J- B. Labégorre et al.,
ACS Applied Materials and interfaces 10, 6415 (2018).

Magnetic and transport measurements

Electrical resistivity and Seebeck coefficient: single crystals, bulk and thin films

Thermal conductivity: bulk materials and single crystals (home made set-ups: steady state technique or heat pipe)



2D single crystals
 PdCoO_2

R. Daou et al., PRB91, 041113 (2015)

Magnetic properties: 2K – 1000K, up to 14T

Transport properties : 2K – 400K up to 14T in PPMS systems
+ 300K – 1000K in ZEM3 + Laser Flash