

**Keywords:** In2O3 film, texture, stress, combined analysis

## Combined Analysis in 2015: XRD (Texture, Residual Stresses, Microstructure) complemented by fluorescence (XRF and GiXRF) and Electron Diffraction

Daniel Chateigner<sup>1</sup>, Luca Lutterotti<sup>2</sup>, Bérenger Caby<sup>3</sup>, Magali Morales<sup>4</sup>, Giancarlo Peponi<sup>5</sup>, Olivier Pérez<sup>1</sup>, Philippe Boullay<sup>1</sup>, Emmanuel Nolot<sup>3</sup>

1. CRISMAT, CNRS 6508, and IUT, Univ. Caen Basse Normandie, France
2. Univ Trento, Italy
3. LETI, CEA Grenoble, France
4. CIMAP, Univ Caen Basse Normandie
5. Fondazione B. Kessler, Trento, Italy

email: [daniel.chateigner@ensicaen.fr](mailto:daniel.chateigner@ensicaen.fr)

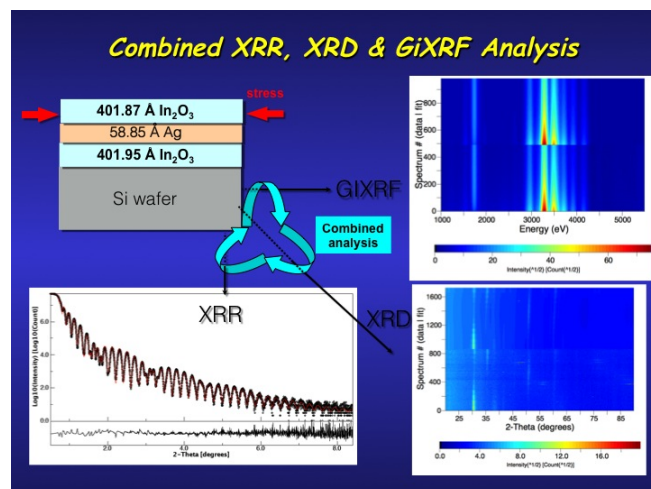
The 12-years old methodology called Combined Analysis using rays (x-rays, neutrons, electrons) has proved its efficiency in particular in treating QTA from diffraction spectra using x-rays, neutrons and electrons.

Its success concerning Quantitative Texture Analysis summarises as three main points:

- it avoids tricky data reductions and corrections, that depend on more or less uncontrolled parameters, these latter becoming fitted parameters that are then better estimated
- it solves the difficult overlapping peaks problem (intra- and interphases), with the use of an extended Rietveld approach
- it includes the determination of other important quantities, like residual stresses, crystal sizes and microstrains, structures ...

Not only Combined Analysis avoids false minima in the refinements when e.g. texture or structure is the only targeted aspect, but it also allows to benefit from anisotropies in real samples rather than to suffer for them during characterizations.

We will show on an In2O3/Ag/In2O3 stack, that Combined Analysis can be generalized to more characterization techniques. X-ray Specular Reflectivity is one of them, implemented for more than 10 years, and recently X-ray Fluorescence got incorporated, allowing another view of materials' elemental compositions, from low-angles oscillations and total fluorescence.



**Figure 1.** A XRF-GiXRF-QTA-RSA-QMA combined analysis of an In<sub>2</sub>O<sub>3</sub>/Ag/In<sub>2</sub>O<sub>3</sub> stack