Combined Analysis in 2017: XRD (Structure, Texture, Phases, Residual Stresses, Microstructure) complemented by fluorescence (XRF and GiXRF) and Electron Diffraction

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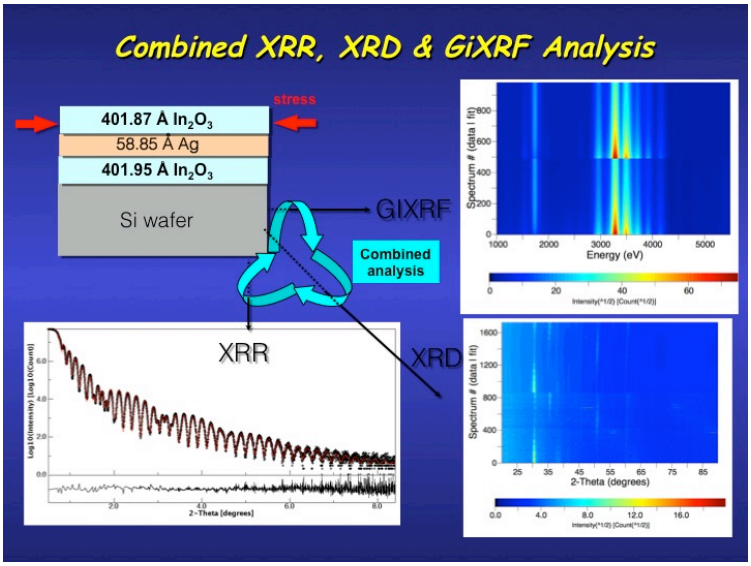
The 14-years old methodology called Combined Analysis using rays (x-rays, neutrons, electrons) has proved its efficiency in particular in treating QTA from diffraction spectra using x-rays, neutrons and electrons. Its success concerning QTA summarises as three main points:

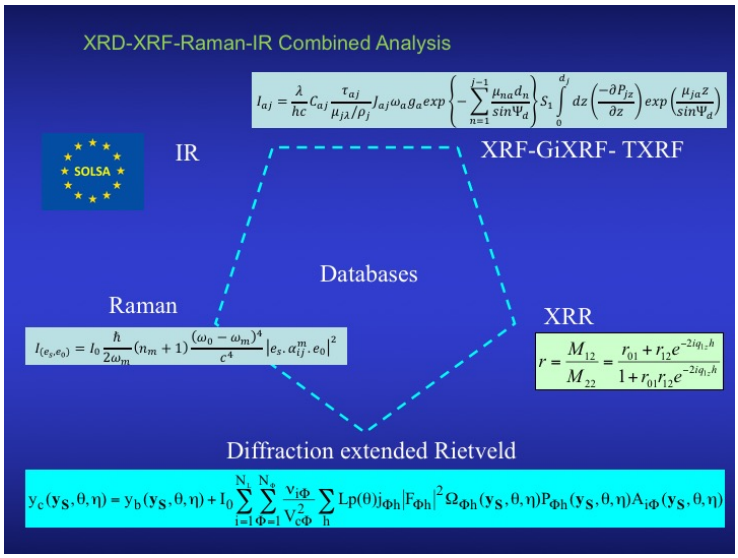
- it avoids tricky data reductions and corrections, that depend on more or less uncontrolled parameters, these latter becoming fitted parameters that are then better estimated
- it solves the difficult overlapping peaks problem (intra- and interphases), with the use of an extended Rietveld approach
- 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.

On one hand we will show on an $In_2O_3/Ag/In_2O_3$ stack that Combined Analysis can be generalized to more characterization techniques. X-ray Specular Reflectivity is one of them, implemented for more than 12 years, and recently X-ray Fluorescence got incorporated, allowing another view of materials' elemental compositions, from low-angles oscillations and total fluorescence. On the other hand, we will elaborate on the future vision of Combined Analysis, to incorporate Raman and IR spectra within the formalism.



a)



b)

a): A XRF-GiXRF-QTA-RSA-QMA combined analysis of an In_2O_3/Ag/In_2O_3 stack, b): Implementation of more spectroscopic techniques within Combined Analysis, as envisioned in the EU SOLSA project