

**Workshop : Local Mechanical Stresses and Microdiffraction
ESRF, Grenoble, September 28-29, 2006**

Context :

This workshop follows the start of the operation of the new **white beam microdiffraction station**, on the CRG-Interface BM32 beamline at the ESRF in Grenoble, in March 2006.

This station was installed thanks to a collaboration between the CEA/DRFMC (SP2M and SPrAM), the CNRS (Laboratoire de Cristallographie and SERAS) and the CEA/LETI.

It is a unique instrument in Europe at the moment.

The new instrument :

The white beam microdiffraction station will allow to map in 2D the crystalline orientations and stresses, in thin poly-crystalline or single-crystalline films. Lateral resolution will be around 0.5×0.5 micron². The technique is of the "micro-Laue" kind. It consists in scanning the sample surface in x and y with a polychromatic x-ray microbeam. At each x,y position, the single-crystalline grain that is illuminated by the beam gives rise to a Laue diffraction diagram (a series of spots) that are recorded on a 2D detector. The analysis of the Laue diagram allows to deduce the grain orientation and its state of strain.

Aim of the workshop :

The goal of the workshop is to regroup the future users of the instrument, and more generally the scientists interested in the determination of local stresses in crystalline materials.

The focus will be on :

- the methods to interpret and quantitatively exploit the microdiffraction data (orientation maps, stress maps, distorted Laue patterns)
- the description and simulation of complex materials, and the use of microdiffraction to help progress in the theoretical description.
- the effect of internal stresses on physical properties

Organisation :

The workshop will be divided in three plenary sessions :

The first session will describe the techniques that are available to measure local and global strains, and to image the material. Particular focus will be put on the specificities of white beam microdiffraction compared to the other techniques.

The second session will present the current state of knowledge regarding the description of the mechanical state of a polycrystalline material, and the description of how this material evolves, deforms, flows and breaks when submitted to external excitations (mechanical, thermal ...)

The third session will address the relation between the microstructure, the stresses, and the other physical properties of a material (i.e. outside mechanics). Several domains of technological importance will be considered, in particular magnetic materials, ferroelectric materials, microsystems and microelectronics circuits.

The last session will in particular aim at giving an overview of what can be the consequences (desirable or undesirable) on the physical properties of a crystalline material, when non-uniformities of the stress distribution are present on a micron scale.

A poster session will take place to allow all the participants to contribute, present and discuss their results.

A round table discussion, to which all participants are invited to contribute, will finally take place, where we will summarize the progress made during the workshop on the questions initially raised. We will also try to update, in the different domains, a list of topics that can benefit from the determination of local stresses using microdiffraction. The goal is also to discuss the strategies to apply in the various cases, in order to optimize the impact of the experimental results on the improvement of theoretical models.

For those interested, a visit of new microdiffraction station will be organized, to give potential users a flavor of the instrumental aspects and to promote technical discussions.