DIRECTION DES SCIENCES DE LA MATIERE,
INSTITUT RAYONNEMENT MATIÈRE DE SACLAY

SERVICE DE PHYSIQUE ET DE CHIMIE DES SURFACES ET DES INTERFACES

SEMINAIRE *

Vendredi 5 Février 2010 à 11h00

Bâtiment 466, salle 111 - CEA Saclay, 91191, Gif sur Yvette

X-ray diffraction with focused x-ray beams: imaging single micro- and nano-objects

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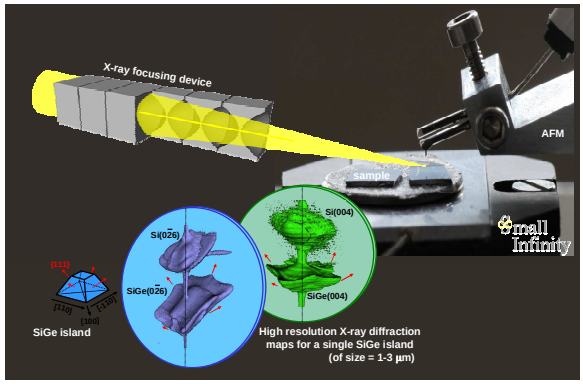
Synchrotron SOLEIL

Invité par Antoine Barbier



X-ray diffraction is a powerful non-destructive tool for the analysis of nanostructures. In 'standard' diffraction experiments, ensembles of objects are characterized yielding averaged, statistical properties. Thus, it can be of high interest to measure individual sub-micron sized objects to understand the changes in properties when approaching the nanoscale.
Focused x-ray beams are used to localize, identify and probe individual objects one by one. In a scanning mode, a 2-dimensional image of the sample is recorded, which allows the reproducible alignment of a specific nanostructure for analysis. Then, on particular objects, the x-ray scattered signal is recorded and modeled, to access the shape, strain and composition inside the object with (sub-) micron resolution.
Without entering into details, I intend to focus on examples of single structures measurements, structures having one, two or three dimensions in the (sub-) micron range:

i) Epitaxial SiGe islands on Si(001): access to 3d strain inside specific islands is granted;

ii) Rolled Up NanoTubes: the lattice parameter distribution and the strain were measured (and modeled) for single tubes (elastic theory).

iii) Local characterization of the strain release in lithographed objects.

An example of *in-situ* combination of x-ray microdiffraction with other micro-probe experiments *on the very same* individual object (simultaneous coupling of local probe diffraction with Atomic Force Microscopy) will be shown as well; by interacting with the objects, one can address elastic properties for individual nano-structures out of an ensemble.

In addition, all the approaches shown here can be combined with the use of coherent (diffraction) imaging- and direct reconstruction- methods.
By addressing shape, strain and composition at the nanoscale, the spatially resolved micro- / nano-diffraction from low-dimensional systems is expected to play an important role in the understanding of the structure properties of nanomaterials, and provide a better control on their fabrication and functionality.

* SERA PRECEDE D'UNE PAUSE-CAFE A PARTIR DE 10H30

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