

Séminaire SOLEIL

3D Bragg x-ray ptychography : a new microscopy for strain imaging

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Invitée par Alessandro COATI

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Grand Amphi SOLEIL

Hard X-ray lens-less microscopy holds the promise of a resolution power meeting the need of nanoscience, owing to the possibility of circumventing the limits of state-of-the-art X-ray lenses [1]. Beyond the resolution issue, the complex-valued wavefield is imaged, ensuring truly quantitative information on the sample scattering contrast. Furthermore, combining this approach to the Bragg geometry allows providing nano-resolved images of defects and strains in crystals, in a non-destructive manner [2].

This X-ray microscopy concept makes use of far-field coherent intensity patterns produced by third generation synchrotron sources. Instead of lenses, numerical tools are employed to retrieve the exit-field at the sample position [1]. As an introduction, we will describe the capabilities and actual limits achieved in the differently proposed lens-less microscopy techniques dedicated to crystal imaging [3,4]. The new perspectives offered by the ptychography method will be further detailed. It allows the retrieval of the 3D sample scattering contrast with a nanoscale resolution and over a -possibly- infinite field of view. Our recent successful developments of X-ray Bragg ptychography will be illustrated by numerical and experimental results [5,6].

The accurate and detailed knowledge of the crystalline structures at the nanoscale is highly desirable for its potential to bring new insights and understandings in a large variety of nanoscience material problems : this challenge is expected to be met by X-ray Bragg ptychography.

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- [1] H. N. Chapman and K. A. Nugent, *Nature Photonics* **4**, 833-839 (2010).
- [2] I. K. Robinson and R. Harder, *Nature Mater.* **8**, 291-298 (2009).
- [3] A. Diaz, V. Chamard et al., *New Journal of Physics* **12**, 035006 (2010).
- [4] V. Chamard et al., *Phys. Rev. Lett.* **104**, 165501 (2010).
- [5] P. Godard, M. Allain and V. Chamard, *Phys. Rev. B* **84**, 144109 (2011).
- [6] P. Godard et al., *Nature Comm.* **2**, 568 (2011).

**Ce séminaire sera suivi d'une pause-café**

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi SOLEIL du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).

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