Réunions scientifiques

Séminaires

Séminaire SOLEIL

Local Materials Structure at the Meso-and Nano-Scale Studied by Polychromatic Microdiffraction

Gene E. ICE

(ORNL, Oak Ridge National Laboratory, Oak Ridge, TN, USA)

Invité par Paul DUMAS

Vendredi 11 décembre à 15h00
Petit Amphi - Bat. Accueil SOLEIL

A long-standing question of materials science is how atomic-scale interactions self organize atoms into mesoscale and nanoscale structures. This simple question is central to materials science because the properties of most materials are dominated by mesoscale structures and dynamics. For example, self-organization is essential to understand grain-growth and deformation microstructure and to understand their effects on plasticity, strength, fracture, transport and other materials properties. The emergence of multi-scale modeling, molecular dynamics and fast parallel computational tools creates an opportunity to revolutionize our understanding how local interactions lead nano and mesoscale structures. This development will allow for far more accurate predictive power for materials behavior. To understand how meso-structures arise, and how they influence materials behavior, it is essential to map *local* elemental composition, crystal/local structure, and geometrical/chemical defect distributions. In materials, this information is mathematically approximated by three-dimensional (3D) tensor fields, which are typically highly heterogeneous. For this reason, 3D quantitative probes are essential.

X-ray microdiffraction is particularly interesting as it provides detailed *atomic-resolution* reciprocal-space information about local crystalline structure correlated with the *mesoscale* (0.1-10 m) real-space resolution of the probe. Furthermore unlike almost any other probe, x-ray microbeams can nondestructively characterize materials properties in three-dimensions and can observe mesoscale evolution as a response to underlying driving forces (e.g. stress). Applications of 3D polychromatic microdiffraction will be described to show how microdiffraction with polychromatic beams and achromatic optics can address fundamental long-standing questions of materials science and can guide emerging theoretical developments.

Acknowledgement

This work would not have been possible without the efforts of many collaborators. These include, B.C. Larson, J.-S. Chung, W. Lowe, J.D. Budai, J.Z. Tischler, W. Liu, W. Yang, J.W.L. Pang, F. J. Walker, A. Khounsary, L. Assoufid, A. Macrander and R.I. Barabash. Work sponsored by the U.S. Department of Energy (DOE), Basic Energy Sciences, Division of Materials Sciences and Engineering under contract DE-AC05-00OR22725. Experiments were performed on Unicat beamline 34-ID at the Advanced Photon Source Argonne ll. Both 34-ID and the APS are supported by the DOE Office of Basic Energy Science.

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).*

SYNCHROTRON SOLEIL
Division Expériences - L'Orme des merisiers - Saint-Aubin - BP 48 – 91192 GIF S/YVETTE Cedex
http://www.synchrotron-soleil.fr/portal/page/portal/Soleil/ToutesActualites
Secrétariat Division Expériences : sandrine.vasseur@synchrotron-soleil.fr