

High-Precision Structural Materials Science for Nano-Materials by Synchrotron Radiation Powder Diffraction

Masaki TAKATA

(RIKEN SPring-8 Center, JASRI/SPring-8, Hyogo, Japan and The University of Tokyo, Kashiwa, Chiba, Japan)

Invité par Sylvain RAVY

Lundi 22 Octobre à 15h00
Grand Amphi Soleil

Séminaires

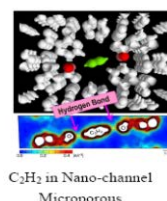
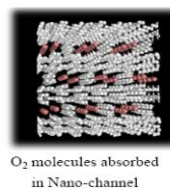
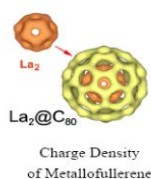
For the research of structure-property relationship of the novel nano-materials, it's own peculiar structural information is always indispensable. So far, we have carried out the charge density studies of the metallofullerenes and the coordination metal organic solids having uniform nano-sized channel structure by the Maximum Entropy Method (MEM) [1].

Consequently, using synchrotron radiation (SR) powder data, has been successfully applied to find metal atoms in fullerene cage [1,2] and gas molecules adsorbed in nano-channel microporous compounds [3]. The key of the success of the structural studies was the application of the MEM to charge density imaging of diffraction data, since it was very difficult to determine the position and structure of atoms and molecules trapped in the nano-sized space of fullerene cage and microporous by the conventional X-ray structure determination technique. The high counting statistics of diffraction data due to the SR utilization was also fundamental key to achieve precise results. In the talk, the advanced technique of synchrotron radiation powder experiment at SPring-8 and the various peculiar structures of the novel nano-materials will be presented.

Very recently, to give a better understanding about the amorphous-crystal phase change mechanism [4], we have been developing the "X-ray pinpoint structural measurement technique" at SPring-8, which is XRD measurement system in ~100 nm spatial resolution and ~40 ps time resolution with focusing X-ray by a zone plate. Our recent challenge for the time resolved X-ray diffraction experiment of DVD medial material will be also presented.

References

- [1] M. Takata, *et al.*: *Nature* **377** (1995) 46.
- [2] M. Takata, *et al.*: *Phys. Rev. Lett.* **78** (1997) 3330.; C.-R. Wang, *et al.*: *Nature* **408** (2001) 426; C.-R. Wang, *et al.*, *Angew. Chem. Int. Ed.* **40** (2001) 397; E. Nishibori *et al.*, *Angew. Chem. Int. Ed.* **40** (2001) 2998; M. Takata, *et al.*, *Chemical Physics Letters* **372** (2003) 512; E. Nishibori, *et al.*, *Phys. Rev. B* **69** (2004) 113412.; Bao-Yun Sun, *et al.*, *Angew. Chem. Int. Ed.* **44** (2005) 4568
- [3] R. Kitaura *et al.*: *Science* **298** (2002) 2358.; Y. Kubota, *et al.*, *Angew. Chem. Int. Ed.* **44** (2005) 920-923; R. Matsuda, *et al.* *Nature* **436** (2005) 238-241
- [4] S. Kohara, M. Takata *et al.*, *Appl. Phys. Lett.*, **89** (2006) 201910-1 - 201910-3



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