



Contribution ID: 118

Type: Oral

Live cell nano-imaging free from radiation damage by using X-ray free-electron laser

Thursday, 26 November 2015 14:15 (30 minutes)

Coherent diffractive imaging (CDI) is a growing technique in photon science. In CDI, sample images are numerically reconstructed from the coherent diffraction data without the need for objective lenses. CDI is thus advantageous for X-rays, for which high-magnification objective lenses are difficult to fabricate. CDI has been demonstrated to be a powerful tool in visualizing cells and organelles using synchrotron radiation. Emerging X-ray free-electron lasers (XFELs) with femtosecond pulse durations further extends the ability of CDI to achieve spatial resolution beyond the conventional radiation-damage limitation.

We performed live cell nano-imaging using a Japanese XFEL facility, SACLA. We employed pulsed coherent X-ray solution scattering (PCXSS), a form of X-ray CDI, developed by our group [1,2]. A unique feature of PCXSS is to keep solution sample under a controlled environment in micro-liquid enclosure array (MLEA) chips. We succeeded in reconstructing a live cell image from a coherent diffraction pattern recorded with a single XFEL shot [2]. The reconstructed image quantitatively revealed the internal structures, e.g. high-image-intensity structure indicative of dense DNA. PCXSS can also be effectively applied to nano-imaging of materials functional in solution.

References:

[1] J. Pérez and Y. Nishino, Curr. Opin. Struct. Biol. 22, 670–678 (2012).

[2] T. Kimura et al., Nature Commun. 5, 3052 (2014).

Keywords

XFEL, pulsed coherent X-ray solution scattering, CDI

Primary author: Prof. NISHINO, Yoshinori (Research Institute for Electronic Science, Hokkaido University)

Co-authors: Prof. OSHIMA, Tairo (Institute of Environmental Microbiology, Kyowa-kako Co. Ltd.); Dr KIMURA, Takashi (Research Institute for Electronic Science, Hokkaido University); Dr JOTI, Yasumasa (Japan Synchrotron Radiation Research Institute); Dr BESSHO, Yoshitaka (Institute of Physics, Academia Sinica)

Presenter: Prof. NISHINO, Yoshinori (Research Institute for Electronic Science, Hokkaido University)

Session Classification: Techniques I

Track Classification: Beamlines, Instrumentation and Techniques