Nobuo Kamiya, J Material Sci Eng 2016, 5:8 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.049

Two alternative structures of oxygen-evolving complex in photosystem II found by X-ray crystallography at extremely low doses

Nobuo Kamiya
Osaka City University, Japan

Oxygen-evolving complex (OEC) is the heart of photosystem II (PSII), which extracts electrons from water molecules using solar light energy in photosynthesis. Crystal structure of PSII has been resolved at a resolution of 1.9 Å (Umena, Kawakami, Shen and Kamiya, *Nature* (2011)), and chemical formula of OEC is fixed as Mn_4CaO_5 $(H_2O)_4$ for the first time. Based on the structural information (PDB-ID: 3WU2), researchers make efforts to elucidate the mechanism of oxygen-evolving reactions in OEC according to the Kok cycle model and to develop new catalysts for water splitting, which are required in artificial photosynthesis. Because OEC is highly sensitive to X-ray irradiation, however, X-ray reduction of OEC and structure change inductions have been discussed on the results from XAFS and DFT computational studies for the past five years. In order to overcome the X-ray reduction problem, we prepared highly isomorphous crystals of PSII and succeeded recently to collect two datasets of diffraction intensities at extremely low doses of 0.06 and 0.24 MGy (0.81 MGy for the previous dataset) at beamlines of SPring-8, BL38B1 and BL44XU. Obtained structures were compared with each other and with 3WU2, and two alternative structures of OEC were found in two monomers in an asymmetric unit of crystal. I will discuss in my talk about the meanings of the alternative structures and X-ray reduction effects on OEC.

Biography

Nobuo Kamiya has completed his PhD from Nagoya University, Japan and Post-doctoral studies from Photon Factory (PF), High Energy Accelerator Research Organization (KEK). He has done his research on Photosystem II. He has constructed Structural Biology Beamlines at PF and SPring-8. At present, he is a Professor of the OCU Advanced Research Institute for Natural Science and Technology (OCARINA), Osaka City University, and is continuing X-ray crystal structure analyses of proteins relating to photosynthesis.

nkamiya@sci.osaka-cu.ac.jp

Notes: