

Present status of time resolved measurement using X-ray absorption spectroscopy at SPring-8

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X-ray Absorption Fine Structure (XAFS) is powerful tool to investigate electric structure and local structure around X-ray absorption atom. Time resolved XAFS measurement developed from appearance of synchrotron radiation and have been applied to many fields. For example, time-resolved XAFS is applied for the catalytic reaction at the in-situ condition and give us the information about how the chemical reaction progresses. We will introduce three representative time-resolved XAFS measurement.

(Super) Quick XAFS (QXAFS),

In QXAFS, the monochromator sweeps quickly (or oscillates at high frequency in Super QXAFS) and it measures the incident X-ray and transmission/fluorescence X-ray intensity continuously. The time resolution depends on the sweep speed of monochromator and the flux of X-ray. The fastest time-resolution of QXAFS in SPring-8 is 800 μ s/spectrum which using galvano motor driven monochromator and very compact Si channel-cut crystal without cooling system.

Energy Dispersive XAFS (DXAFS)

DXAFS is a method of measuring the XAFS spectrum by one-shot acquisition. DXAFS measurement is done by converting the energy of X rays into position information using a polychromator and monitoring the position and intensity using a position sensitive detector. So DXAFS has higher time-resolution than QXAFS and the time-resolution is about few ms as usual.

Pump-probe XAFS

Pump-probe XAFS is a method that uses bunch structures of synchrotron radiation. X-ray from the synchrotron facility has a time width. For example at SPring-8, the time width of each X-ray is about 50ps and interval between each X-ray is about 100nsec. Pump-probe XAFS use such time-structure and achieve high time-resolution. However, this method can only apply for repeated reactions.

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