Contribution ID: **19** Type: **Invited/plenary talk**

INVITED: Development of fluorescence-yield wavelength-dispersive soft X-ray absorption spectroscopy for real-time observation of surface chemical reactions

Tuesday, 6 December 2022 17:30 (30 minutes)

We have recently developed a fluorescence-yield wavelength-dispersive soft X-ray absorption spectroscopy (XAS) technique, by which the XAS data is recorded without scanning the monochromator [1], and the real-time observation of surface chemical reactions under near ambient pressure conditions up to ˜5000 Pa has been realized [2].
In the technique, the wavelength-dispersed X rays illuminate the sample, where the wavelength (photon energy) continuously changes as a function of position, and the fluorescence soft X rays generated at each position on the sample are separately focused by an imaging optics consisting of two spherical mirrors onto each position at the detector. Accordingly, the fluorescence-yield soft X-ray absorption spectrum is obtained without scanning the monochromator. The sample area is separated by two 3 mm × 3 mm Si3N4 windows with a thickness of 200 nm to prevent the reaction gases from flowing into the beamline and imaging optics.
Moreover, the developed technique has been combined with a depth-resolved technique, in which a set of XAS data is simultaneously obtained at different probing depths by correcting the fluorescence soft x rays at different emission angles. By using the time- and depth-resolved XAS technique, we observed the oxidation reaction proceeding from the surface to inside in real time (without halting the reaction), and clarified the time evolution of the depth profile of the chemical species [3].
Recent results for the real-time observation of the surface chemical reactions with depth-resolved analyses will be presented after the introduction to the developed technique.

[1] K. Amemiya, K. Sakata, and M. Suzuki-Sakamaki, Rev. Sci. Instrum. 91 (2020) 093104.
[2] K. Amemiya, K. Sakata, and M. Suzuki-Sakamaki, e-J. Surf. Sci. Nanotech. 20 (2022) 135.
[3] K. Sakata, M. Suzuki-Sakamaki, and K. Amemiya, Nano Lett. 21 (2021) 7152.

if ”Other”, please specify:

I apply for a travel grant

No

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