

## **XANES spectroscopy for estimating high-hypoxic conditions in sediment of Lake Biwa**

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In a hypolimnion of a relatively deep lake, depletion of oxygen caused by eutrophication and global warming is a serious problem. Lake Biwa is the largest monomictic freshwater lake in Japan and the most important water reservoir. In 1990, *Thioploca* spp. were found in sediment of Lake Biwa. Since they are microaerophile sulfur (S) bacteria inhabiting sediment, it is expected to use as an index organism for a hypoxic condition in sediment. To estimate the hypoxic condition qualitatively as well as quantitatively, synchrotron-based X-ray absorption near edge structure (XANES) spectroscopy at S K-edge was applied.

XANES spectra were taken with the soft X-ray XAFS beamline BL-10 in the SR Center, Ritsumeikan University. Using an atmospheric-pressure sample chamber and a home-made wet cell, the measurement was conducted under a solid-liquid coexisting system. Samples were collected using core samplers at 3 points with different environment. Although each sediment was an anaerobic condition, remarkable differences in dissolved oxygen were not detected among them. The XANES experiment was performed on the same day or next day after sampling. The S K-edge XANES spectra exhibit 3 distinct peaks at about 2468, 2472 and 2482 eV. Comparing with the reference spectra, the first peak at 2468 eV was assigned to S(-II), the second peak at 2472 eV to S(-I) – S(+I), and the third peak at 2482 eV to S(+V) and S(+VI). To get semi-quantitative information, we performed the curve-fitting analysis and estimated the percentage of each S species. The XANES spectrum of the sediment which showed the highest total carbon value was comprised of only S(-II) – S(+I), and it should be noted that S(-II) accounted for approximately 80% of it. This indicates the sampling point was under highly hypoxic conditions. This result suggests that XANES is an effective method to explain matter cycles partly as well as to estimate hypoxic conditions in sediments.