# Environmental Science

X-ray, which is a useful analytical tool for Environmental Science, makes it possible to analyze environmental objects directly, nondestructively and without pretreatment. These features allow the analyzed samples to be preserved for further investigation or as evidence, because the chemical states of elements of interest do not change during experiments and the obtained data are reproducible and objective.

The above-mentioned items are related to general analytical methods using X-ray, including those involving laboratory experiments with conventional equipment. Additionally, a powerful X-ray beam from the SPring-8 synchrotron radiation source has enabled microanalysis, microarea analysis, and chemical state analysis for almost all elements.

The three topics described below are XAFS applications for toxic heavy elements in environmental samples. The characterization by XAFS of heavy elements is important because the toxicity of elements often depends on the oxidation state and the local structure around an atom.

The first topic, which has been investigated by Takahashi *et al.*, concerns organotin compounds used in marine anti-fouling paints and fishing nets. They have determined “the organic extent” of organotin compounds.

The second topic, which has been investigated by Fujiwara *et al.*, concerns environmental restoration technologies using microorganisms. Reduction steps of Se (VI) by anaerobic bacteria have been clarified by XANES of the Se *K*-edge.

The third topic, which has been investigated by Izumi *et al.*, concerns the removal of trace heavy metals in water. For this topic, a high-resolution detector with a crystal analyzer was employed to measure X-ray fluorescence from Pb and As, although a 19-element solid-state detector was employed for the other two topics discussed in this paper. The chemical states of adsorbed metals have been clarified by XANES analysis, and surface reactions on the adsorbent are discussed.

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