Environmental

SCIENCE

This section covers the various research fields, such as environmental problems and technology, geochemistry and environmental enhancement, that use newly developed functional materials. Not only the development of high-performance materials but also the solution of environmental problems requires the understanding of the mechanisms of phenomena at the atomic level using synchrotron radiation X-rays. Most actual environmental samples and materials have amorphous structures. Thus, the X-ray absorption fine structure (XAFS) method is an indispensable tool for studying them as shown in topics selected in this section.

In the first topic, Hokura *et al*. showed the chemical state of Cd at specific positions in a two-dimensional cellular distribution in hyperaccumulating plant tissues determined using a high-energy μ-XAFS technique. This technique is powerful for obtaining information on the distribution and chemical state of heavy elements.

The second topic concerns the geochemistry of toxic elements. Takahashi studied the chemical states of Te and Se in various solid-water systems on the earth' s surface by the XAFS method, and identified the origin of the large difference in their abundances in marine ferromanganese oxides relative to those in seawater.

The third and fourth topics are photocatalysts to be used for environmentally friendly chemical processes, such as the oxidative decomposition of pollutants and low-temperature NO_x reduction from the exhaust gas. Teramura *et al*. directly showed the formation of Rh particles on a TiO_2 photocatalyst under photoirradiation for the first time by an *in situ* time-resolved energy-dispersive XAFS method. Yamazoe *et al.* developed a new structural analysis method that can estimate the structure of the WO_x unit easily from the XANES spectra at the W L_1-edge and L_3-edge. They applied this method to the estimation of the structure of W oxide species loaded on TiO_2. These studies are leading to the development of more effective photocatalysts.

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