

ENVIRONMENTAL





SCIENCE

Environmental science encompasses various research fields, such as environmental problems, geochemistry and environmental enhancement using new techniques or functional materials. X-ray analytical methods using synchrotron radiation, such as X-ray absorption fine structure (XAFS) and X-ray diffraction (XRD), are powerful tools for the speciation of environmental samples, since, in many cases, they are very dilute, small in quantity, or spatially and chemically-inhomogeneous. Recently, newly developed techniques, such as *in situ* micro-XAFS methods, have further accelerated studies of environmental samples from their speciation to the elucidation of the mechanisms behind various environmental phenomenon, such as formation, accumulation, pollution, and leaching.

Topics selected in this section relate to health hazards and environmental protection. The first two topics concern harmful elements and compounds from artificial products. Takahashi *et al.* studied the leaching of Sb, a harmful element, from PET bottles produced in China and Japan into beverages by clarifying the chemical state of Sb in PET by XAFS. They showed that the degradation of PET itself is more important in Sb leaching rather than the chemical state of Sb in PET bottles.

In the second topic, Takaoka *et al.* studied the formation mechanism of toxic chlorinated aromatic compounds (aromatic-Cls) in waste incinerators during thermal processes by specifying the atomic speciation of copper in fly ash using XAFS and XRD. They found the direct chlorination of carbon by copper to be the key reaction in the creation of the aromatic-Cls, and then suggested that the mechanical or chemical elimination of the inflow of copper to thermal facility may inhibit the creation of aromatic-Cls.

In the last topic, Mitsunobu *et al.* studied the interaction of Sb with an abiotic contaminant reducer in an aquatic environment, Green Rust compounds (GR), by XAFS. They showed that the adsorption of Sb to GR with the formation of an inner-sphere complex stabilized the interaction between GR and Sb.

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