Environmental


"Tsuyukusa" - *Asiatic dayflower*

SCIENCE

This section covers various research fields relating to "environment", such as environmental problems and technology, geochemistry, and the analysis of archaeological heritages exposed to the environment for a long time. In many cases, the environmental samples are microscale complex systems, and contain traces of various elements to be investigated. Also, these samples require nondestructive investigation for various reasons, such as they are living specimens or precious samples or there is a risk of chemical change. Thus, analytical techniques using SR X-rays, such as XAFS, XRF, XRD and micro-imaging, are very powerful and useful in environmental research fields.

The first three topics are research on environment problems. The first topic is about the cooling effect on the Earth of anthropogenic aerosols in atmosphere. Takahashi revealed, by XAFS combined with ICP-AES, that almost all oxalate species in aerosols are in the non-hygroscopic form because of the formation of insoluble metal complexes, which inhibit the effect of the aerosol particles as cloud condensation nuclei. Takahashi concludes that reevaluation of the contribution of the aerosols on the Earth's climate is necessary.

The second topic concerns the distribution and behavior of iodine including radioactive iodine, which strongly affects human health, in the environment. Togo *et al*. determined the species of iodine in the soil-water system nondestructively by XAFS and HPLC-ICP-MS for the first time, which provided information that enables the estimation of iodine mobility in the environment.

The third topic is the formation mechanism of toxic chlorinated aromatic compounds (aromatic-Cls) in fly ash. Takaoka *et al*. investigated the role of metal elements during the formation of aromatic-Cls. In this study, they studied the thermochemical behavior of zinc and chloride by investigating the chemical state of zinc chloride at the temperature of aromatic-Cl formation for model and real fly ash samples, by the *in situ* XAFS method.

The fourth topic is the detoxification process of Hg in tissues of striped dolphin. Although Hg might be detoxified by forming HgSe in tissues other than the liver, there has been no solid evidence of the presence of HgSe in these tissues. Nakai *et al*. nondestructively clarified the structure and chemical species of trace Hg in these tissues by combining μ-XRF-XRD and XAFS.

The last topic is an analytical study of archaeological heritages. The identification of wood from archaeological heritages at the genus level provides useful information and new perspectives on the origin of the heritages. Nondestructive microscopy techniques are suited to the investigation of archaeological wood samples, since these samples are often precious, small, and brittle owing to biological attack or degradation over a long time. Sugiyama *et al*. applied X-ray micro-CT imaging to old wood masks made in the 16th century, and showed this technique to be a powerful tool for the identification of archaeological wood.

Tomoya Uruga