Environmental

SCIENCE

In environmental science, research targets are often in very small, dilute and amorphous forms. Thus, SR-based XRF and XAFS methods are used frequently for clarifying the distribution and/or chemical state of elements in the environmental samples. Recently, the research quality in this field has improved in conjunction with the development of the measurement techniques described below. First, combined methods of micro-SR technique and the other microscopic techniques conducted for the same field of view in the sample have been developed to yield information about the sample state directly related to its chemical state with high spatial resolution. Second, the performance of the micro-SR methods has been improved in various points, such as spatial resolution, measurement energy region, and measurement time. In particular, the newly installed Kirkpatrick-Baez focusing mirror system in BL37XU and BL39XU improved the spatial resolution of scanning microscopic XRF/XAFS imaging from 800 nm to 100 nm. Third, an XAFS measurement system in the soft X-ray region, including a scanning microscopy system, was installed at BL25SU. New findings obtained with these measurement systems are expected to be published in the near future. Finally, the XAFS measurement system has been upgraded to realize high-quality XAFS spectra, which makes it possible to perform the chemical state analysis more accurately by comparison of EXAFS, profiles in addition to conventional XANES analysis.

In the first study, Mitsunobu *et al*. developed a novel combined method of micro-XAFS and fluorescence in situ hybridization, and successfully characterized biominerals associated with a targeted microbe.

In the second study, Yamaguchi *et al*. measured, in rice, the distribution of cadmium, zinc and manganese using micro-XRF and that of sulfur using an electron probe microanalyzer. They found that the transport of these elements was controlled by the functional interconnection of vascular bundles in the rice node.

The third study concerns lead in contaminated shooting-range soils. Hashimoto *et al*. revealed the immobilization mechanism of lead from ammunition shells by chemical speciation of soil lead using XAFS.

In the fourth study, Takahashi revealed the solubility change of iron in Asian dust in seawater during transport from China to Japan by characterizing iron species using XAFS, and discussed that this change affects the global environment through growth of phytoplankton in the sea.

Tomoya Uruga

"Sakura"- *Cherry blossom*