Environmental


"Ume"- *Japanese Apricot*

Environmental science covers various research fields, such as environmental problems, environmental enhancement using new techniques or functional materials and geochemistry. Recently, the amount of research on practical use or product development seems to be increasing in the field of Environmental Science. This trend matches social demands for solving environmental problems, such as pollution and the low-carbon economy. Also, the amount of research on the dynamical change of molecules or nanoparticles under *in situ* conditions is increasing, as seen in topics selected in this section. This bulk of research could be realized by effectively utilizing well-developed measurement techniques using synchrotron radiation X-rays, and databases and know-hows have been accumulated so far.

The first three topics are about spatial distribution or path of harmful elements and compounds from natural or artificial products using micro-XRF/XAFS techniques. The first topic, is about Mitsunobu *et al.*'s measurement of the spatial distributions of Sb oxidation states within a soil particle by the μ-XANES method. They clarified that the more toxic species Sb(III) has a higher affinity to the solid phase than Sb(V), and that the oxidation state is an important factor controlling the mobility and solubility of Sb.

The second topic is about the tracking of nanomaterials that invade the body through the nose. Nanosized particles are now widely used in industrial and medical products, which are more dangerous than micronsize particles. Matsui *et al*. revealed a pathway of diesel exhaust particles (DEPs) from the nose to the brain of mice after whole-body DEP exposure by measuring the major metal elements included in DEPs, such as Fe, Ni and Zn, using the micro-XRF method.

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The third topic is about phosphorus-amended immobilization technologies for metals in soil by plants, so called phytoremediation. Hashimoto *et al*. investigated the effect of phosphorus amendment on the solubility and speciation of Pb in a highly contaminated shooting range soil using the XAFS method.

The fourth topics is about Takahashi *et al*.'s study of the cause of the enrichment of heavy rare earth elements (HREEs) on bacterial cell surfaces using the EXAFS method. They found that the cause is the formation of multiple phosphate surface complexes. The results showed that bacterium-related materials that have phosphate sites can be used as separation agent of HREEs.

The fifth topic is about the mechanism of a newly developed convenient and versatile chemical sensor for sick house gas detection. This sensor consists of organic crystals, which show vapochromism, a reversible color change upon the absorption/desorption of volatile organic compound vapor. Takaya *et al*. revealed the mechanism of these dynamic vapochromic behaviors using XRD and DFT calculations.

The last topic concerns a remarkably active catalyst, which is important from the viewpoint of environmental friendliness and low energy consumption. Okumura *et al*. developed Pd catalysts loaded on zeolites exhibiting excellent catalytic activity in the Suzuki coupling reactions. He studied the formation of Pd a catalyst interacting with zeolites by the time-resolved *in situ* XAFS method, and revealed that atomically dispersed Pd is the active species in this catalytic reaction.

Tomoya Uruga

"Ajisai"- Hydrangea