ADVANCES IN AUTOMATION TECHNOLOGIES FOR SYNCHROTRON RADIATION MEASUREMENTS CONTRIBUTING TO DEVELOP SOIL SEDIMENTS DATABASE ACROSS JAPAN

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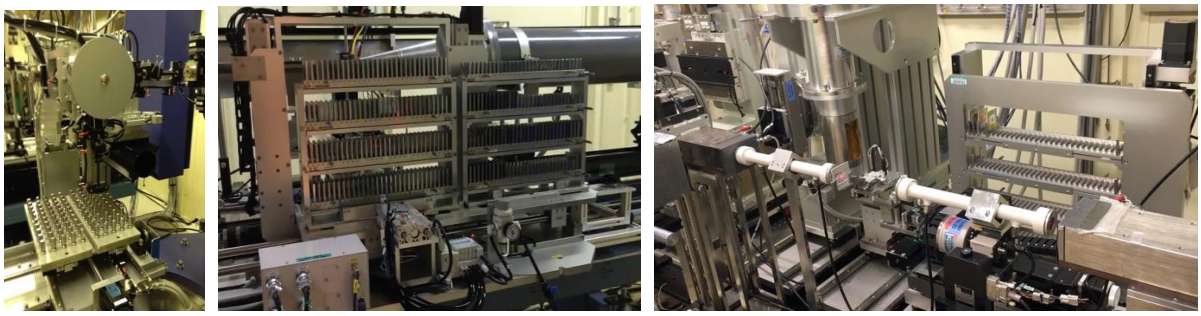
The nationwide database on heavy minerals and trace heavy element compositions of soil sediments collected at over 3000 locations across Japan was completed in 2016 after seven years of development. The data were measured by high-resolution powder X-ray diffraction (HR-pXRD) and high-energy X-ray fluorescence analysis (HE-XRF) using the synchrotron radiation (SR) source of SPring-8, the largest SR facility in Japan. The highly automated measurement systems combined with brilliant SR provided the high-throughput data acquisition of over 100 samples per day using sediment samples of just a few milligrams. This database could not have been constructed without the automated measurement systems.

The COVID-19 pandemic has restricted human contact and posed significant challenges to experiments at public facilities like SPring-8. To overcome such difficulties, promoting automation and remote operation of measurement systems has become increasingly important. The author has been working on automating and streamlining various measurement techniques in order to improve the convenience of SR experiments, including small-angle X-ray scattering (SAXS) and X-ray absorption fine structure (XAFS) analysis, as shown in Fig. 1, as well as HR-pXRD and HE-XRF. These systems also have been contributing to the promotion of industrial use of SR. In this talk, the progress of automation technologies and future prospects on SR experiment will be presented.



(a) (b) (c)

Fig. 1. Automated measurement systems in SPring-8 for (a) powder X-ray diffraction at BL19B2, (b) small-angle X-ray scattering at BL19B2, and (c) X-ray absorption fine structure analysis at BL14B2.