XRF MicroCT at Diamond Beamline I18

Konstantin Ignatyev*, Kalotina Geraki, and J. Frederick W. Mosselmans

Diamond Light Source, United Kingdom

**konstantin.ignatyev@diamond.ac.uk*

Beamline I18 at Diamond Light Source is dedicated to microfocus spectroscopy with micron-sized beam[1]. Recent motor controls / data acquisition software upgrade enabled collecting XRF maps at the raster scanning rates limited only by the useful XRF signal from the sample, which was also increased by the addition of a second Si drift detector. This makes it very suitable for fast XRF microtomography which is crucial for measuring biological samples where a large number of samples is required for statistics[2] as well as for reducing beam damage, and for in-situ materials science studies[3].

The increase in data collection speeds revealed bottlenecks in other parts of the measurement chain beginning with the user mounting and aligning a sample on the stage and ending with the complete reconstructed dataset. For the sample alignment an automatic alignment routine which significantly decreased the sample setup time was developed. For peak fitting and fast and user-friendly tomographic reconstruction – a Python-based open-source application developed at Diamond ("Savu") is used[4], as well as "Dawn" for data visualisation[5].

An example of a recent XRF biological microCT measurement on i18 is the study of metal distribution in seeds of Arabidopsis Thaliana of both wildtype and mutant species with genetic alterations to gain an insight into the effect of specific transport proteins on the micronutrient uptake[2]. The improvements in data collection / analysis described above should make these kind of measurements more routine.

References

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