FAST X-RAY IMAGING „ON-THE-FLY“ WITH A BENCHTOP µ-XRF INSTRUMENT

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Several developments in µ-XRF have been realised recently which improve the analytical performance of this method. The availability of X-ray tubes with higher brilliance and the improvement of the transmission function of poly-capillary optics have made faster and more accurate measurements possible. This method also requires detectors with higher pulse throughput to handle the high generated count rates which can be in the range of up to 500 kcps. This combination allows faster and more accurate position sensitive analysis.

These improvements have effects both on single point measurements – in this case smaller areas can be analysed with higher count rate which means higher accuracy, and for distribution analysis, where shorter measurement time per pixel allows faster measurements. In particular for distribution analysis the other hardware has to be adapted to higher speeds – i.e. the stage for sample movement needs to be faster. Another acceleration of the measurement is possible by measurements "on-the-fly". In that case element distribution can be accumulated even from large areas in minutes. But still acquisition time is relatively high and requires saving all measured data – i.e. position tagged spectroscopy is necessary. This allows for complete data analysis post-processing.

Spatial resolution is also a parameter that has undergone continuous improvement. This can be achieved in a certain range with small step size and a good counting statistics per pixel. More significant improvements are possible with smaller analysed areas i.e. with spot size of the optics. Here new developments show that spot sizes even with high count rates down into the 10 µm range are possible, but only with reduced working distance.

This small spot size allow a confocal geometry which combines optics in the excitation path and in the detection path. This improves the depth resolution of the measurement and allows 3D analysis also for heavier matrices.

These developments will be discussed and particular applications demonstrated.