

Development of HERAKLES: an integrated absorption tomography/X-ray fluorescence scanner for non-destructive 3D analysis on the micro-scale

Brecht Laforce¹, Bert Masschaele^{2,3,4}, Bart Vekemans¹, Manuel Dierick^{2,3},
Luc Van Hoorebeke^{2,3}, and Laszlo Vincze¹

¹X-ray Microspectroscopy and Imaging, Department of Analytical Chemistry, Krijgslaan 281/S12, B9000 Gent, Belgium

¹Radiation Physics research group, Department of Physics and Astronomy, Faculty of Sciences, Ghent University, Proeftuinstraat 86-N12, 9000 Gent, Belgium
[email: Matthieu.Boone@UGent.be]

²Centre for X-ray Tomography, Institute for Nuclear Sciences (INW), Proeftuinstraat 86-N12, 9000 Gent, Belgium
[email: UGCT@UGent.be]

³X-ray Engineering bvba, De Pintelaan 111, 9000 Gent, Belgium
[email: info@xre.be]

ABSTRACT

We report on a radically new instrument integrating three different X-ray based microanalysis methodologies, being absorption computed tomography (absCT), XRF tomography (XRF-CT) and confocal XRF analysis (cXRF). Each of these techniques yields complementary three dimensional information in a basically non-destructive way.

The combination of these three methodologies in the same instrument enables the user to acquire both morphological and elemental 3D information on the micro-scale with a single experimental run. The experimental sequence starts with an absCT scan, providing a visualization of the internal structures of the sample with a resolution of approximately 1 micron. The reconstructed CT images are then used as a means to select the regions of interest for detailed elemental analysis using either the XRF-CT or cXRF stage. Due to the ultra-accurate motor movements, the sample can be positioned in front of the XRF source with micrometer precision, enabling analysis of even the smallest heterogeneities discovered in the sample during the absCT measurement. Furthermore, the complementary information gathered with these techniques opens a wide range of new possibilities for integrated data analysis.

Data demonstrating the precision and scientific value of the new experimental procedure are represented, including measurements on both test samples and “real life” samples.

REFERENCES

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