

MS43 Crystallography for cultural heritage materials

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Coordinated Development of Tubes and Optics for Microfocus Sources: New possibilities for X-ray Analytics of Cultural Heritage Materials

J. Wiesmann¹, J. Graf¹, P. Radcliffe¹

¹incoatec GmbH - Geesthacht (Germany)

Abstract

In recent years, interest in the non-destructive examination of cultural objects has increased considerably. In addition to infrared and optical imaging and spectroscopy techniques, X-ray methods such as X-ray fluorescence, X-ray diffraction, X-ray radiography and X-ray imaging are often used to analyse objects such as paintings and books. In particular, the development of air-cooled microfocus sources with high brilliance that can be used in mobile devices has changed the quality of XRF and XRD analysis in this context. An example is the publication of K. Janssens et al. [1].

Incoatec has long offered these solutions for applications in crystallography and beyond. In addition to our key area of multilayer X-ray optics, we started to develop X-ray sources ourselves in 2011. The aim was to offer the best combination of optics and sources for specific applications in the analysis of small and macromolecular structures. We succeeded in bringing new solutions to the market that offer a flux density of more than $5 \cdot 10^{10}$ ph/s/mm² in a spot of less than 100µm. In the meantime, we have developed several new metal-ceramic tubes and suitable multilayer optics for different applications.

In our contribution we will summarise the most important parameters for combining multilayer optics and microfocus sources to achieve collimated or focused X-rays with high brilliance. We will present examples of the use of these sources for the analysis of cultural heritage materials using different XRD and XRF methods.

References

[1] Macroscopic X-ray powder diffraction scanning : possibilities for quantitative and depth-selective parchment analysis

Vanmeert Frederik, de Nolf Wout, Dik Joris, Janssens Koen; Analytical chemistry - ISSN 0003-2700 - 90:11(2018), p. 6445-6452

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