

FLUXES WITH INTERNAL STANDARDS – THE FUTURE FOR HIGH PRECISION XRF ANALYSIS OF COPPER, IRON AND NICKEL MATERIALS

Stanislav Ulitzka, TWOTHETA XRF Services, Sydney, Australia

David Brown, XRF Scientific Ltd, Perth, Australia

Internal standards have been used for many years in ICP analysis but have only recently been developed for X-ray fusion analysis. In some instances the use of internal standards can eliminate the need to carry out high temperature “loss of ignition” with significant cost and time benefits.

Keith Norrish and his team at CSIRO originally pioneered the internal standard method using a flux with Terbium for the analysis of iron ores. The Tb ratio is used as matrix correction for Fe but its biggest advantage is the automatic correction for errors due to bead curvature and other sample preparation defects. Since the method is capable of obtaining very accurate and precise results for iron LOI can be calculated as a difference and doesn't have to be measured by high temperature TGA. This can significantly reduce the time and cost of analysis.

Following this principle other fluxes have been developed for the analysis of further elements using internal standards. For example, Thulium (at only 1% concentration in the flux) has been tested and successfully implemented at various Nickel mining and processing operations in Australia and overseas. With a comparable precision, fast turnaround, and much lower costs the XRF analysis using a flux with Thulium is challenging established and widely used methods (for example the DMG method).

Another element of considerable commercial interest – copper - can be analysed and corrected for bead curvature and other sample preparation defects using a flux containing Tantalum. Current test work has confirmed that the method is suitable and robust enough to be implemented in mining laboratories.

The authors have demonstrated that using commercially available lithium borate fluxes with internal standards (Ta for copper, Tm for nickel and Tb for Iron) can offer significant analytical and financial advantages.