Application of rapid X-ray diffraction (XRD) and cluster analysis to grade control of ores

U. König (1) and T. Schönbeck (2)

(1) PANalytical B.V, The Netherlands, (2) PANalytical GmbH, Kassel, Germany

The use of high speed detectors let X-ray diffraction (XRD) became an important tool for quality and process control in mining, steel, cement or aluminum industries. As well as the information about the composition of an ore sample it provides useful information in terms of quantification of the crystalline phases and the amorphous content. The investigation of the phases present in an ore body optimizes the mining and process operations (flotation, separation, etc.).

Traditionally grade control of ores has relied on elemental analysis of sampled materials such as blast cone drill cuttings. This analysis provides a standard elemental suite that is used in grade control to assign mined material as grade blocks to high grade, low grade or waste destinations.

Assessment of the mineralogical composition of these samples is more subjective however relying on visual inspection of collected samples and interpretation of the elemental data. This paper outlines an additional technique, rapid X-ray diffraction (XRD) analysis, which has been trialed to establish the mineralogical composition of a sample to supplement the elemental data.

Several case studies where XRD can be used for grade control of base metals will be demonstrated.

Alternative reliable quantification methods will be presented besides well known methods such as Rietveld or calibration based analysis.