Improved on-stream X-ray fluorescence analysis of mineral slurries

B Ganly[1], J Tickner[2]

1. Research Scientist, CSIRO Mineral Resources, New Illawarra Rd Lucas Heights, NSW, 2234, Brianna.ganly@csiro.au
2. Chief Technology Officer, Chrysos Corporation, Gate 4, Waite Rd, Urrbrae, SA, 5064, james.tickner@chrysos.com.au and Adjunct Science Fellow, CSIRO Mineral Resources, New Illawarra Rd Lucas Heights, NSW, 2234

ABSTRACT

The CSIRO Mineral Resources X-ray technologies group develops industrial X-ray fluorescence (XRF) instruments designed to measure the concentrations of precious and base metal such as gold, platinum, nickel and copper in mineral slurries. The intensity of characteristic fluorescent radiation from mineral phases in a slurry is affected by the particle size of the ore being measured. This size variation of the ore particles can lead to substantial analysis error. In extreme cases, the XRF response from a given element can vary more than 50% between samples of the same concentration with varying particle size distributions. These large uncertainties significantly impact the usefulness of XRF as a tool for on-stream elemental analysis for mineral slurries. To combat changes in particle sizes and changes to the matrix material of a slurry, current XRF analysers require regular calibration, which is time consuming and costly to the processing plant.

CSIRO have developed and patented an XRF technique that can identify variations in particle size distributions in slurries, as well as variations of mineralogy for a given element of interest. The technique requires only a small adjustment to a traditional XRF system, and could be incorporated into a range of XRF on-stream analysers irrespective of their configuration within a plant. The goal is to integrate the particle size correction technique into an XRF analyser that includes a combination of improved matrix material corrections and particle size corrections so that it can be used for a variety of applications without the need for regular re-calibration.

We will show measurements of copper ore slurries with varying particle size distributions and varying mineralogy and how this effects the XRF response. We will show our XRF measurements of copper ore samples before and after the particle size correction has been applied to demonstrate the significance of the particle size effect and the results of our correction method.