Continuous Visible to Far Infrared Spectroscopy for the Prediction of Iron Ore Properties

J Carter[1], P Urlings[2] and L Dixon[3]

1. Global Technical Manager, Bureau Veritas Minerals, Canning Vale WA 6155.
john.carter@au.bureauveritas.com

2. Scientific Officer, Bureau Veritas Minerals, Canning Vale WA 6155.
peter.urlings@au.bureauveritas.com

3. Laboratory Manager, Bureau Veritas Minerals, Canning Vale WA 6155.
lyn.dixon@au.bureauveritas.com

ABSTRACT

The benefits of utilising infrared spectra for the determination of iron ore properties has been well established. Visible and short wave infrared devices typically yield characteristic responses from hydrated minerals. Various tools enable the collection of spectra from core, chips or pulps, either using a manual contact probe, or an automated X-Y table and various infrared sensing configurations. Mid- and far-infrared devices, such as a Fourier Transform Infrared (FTIR) spectrometer in diffuse reflectance mode, excel in harvesting information from oxide, silicate, sulfate and carbonate minerals, when presented with a powdered sample.

A number of interpretative methodologies can be used to extract valuable information from the spectrum of each sample. More recently, machine learning capabilities, such as neural networks, have opened up new possibilities to predict chemical, physical and mineralogical properties, along with geological classifications and geometallurgical parameters. When the spectral data includes a complete response from all of the minerals present in the iron ore sample, the information and knowledge obtained becomes more reliable and therefore valuable. By expanding the range of the collected spectrum, iron ore properties previously hidden may be uncovered, while others are improved.

The collection of the spectral response across visible, short, mid and far infrared ranges from an iron ore sample within a single workflow is described in this paper. A laboratory based VNIR-SWIR device is coupled with a FTIR instrument to collect a continuous spectrum from a pulp sample. The benefits of spectra collected on pulp samples, as opposed to chips and core, is discussed.