



Iron Ore | Constituent Analysis

Summary

The chemical composition of iron ore can be analyzed with laser-induced breakdown spectroscopy (LIBS). Both hematite and magnetite have been tested with Progression's iPulse[®] LIBS analyzer for the determination of Si, Fe, and Ca. The real advantage of the LIBS technique is that the results are delivered continuously in real time compared to periodic sampling and the delays of more than 1 hour typical with standard laboratory analysis. Consequently, LIBS can provide a more representative reading of the state of the process. Matrix effects of a specific ore can affect the spectral lines which is overcome by the use of multivariable calibration and spectral normalization techniques which correct for the matrix effects and establish confidence levels for each measurement.

Progression, Inc. is the leader in the development and service of on-line NMR and LIBS in the chemical and mining industries. In 2003 Progression won the prestigious R&D 100 award for the development of its second generation on-line NMR system—the MagModule II[™]. In 2006, the company successfully entered the phosphate industry with its first commercial LIBS application, which was used to measure MgO, CaO, Fe₂O₃, and Al₂O₃ of phosphate rock. Other uses and commercial applications are in the fields of zinc and lead, copper and coal.

Benefit

The iPulse analyzer provides operational and economic benefits to iron ore processors and miners. Progression's instrument can provide nearly continuous data which is transmitted to the plant's control system for either closed loop or operator control.

Sampling

In conjunction with the iPulse, Progression designs and installs application specific, customized sampling systems. Samples are either taken automatically from the process stream or analyzed directly (i.e. conveyor belt). The samples may be returned into the process or sent to a disposal area depending on the needs of the customer.

Sample conditioning is typically not necessary. LIBS has the ability to measure solids, liquids, and slurries, without special sample preparation. Further, the relatively small size (~30 ft³) of the instrument allows for optimal placement within a facility.

Calibration and Results

System calibration and modeling is performed by Progression. Reference data is generated from samples taken at the instrument.

LIBS calibrations are made using reference values typically obtained by other techniques. Since the accuracy of these techniques can vary, it is impossible to specify an absolute accuracy. However, LIBS measurements have proven to be extremely accurate based on both calibration and operational results.

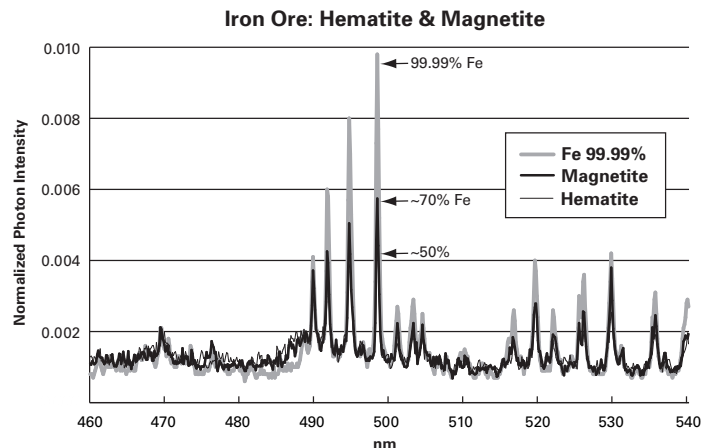


Figure 1: Hematite and Magnetite Ores with 99.99% Fe Reference