

## APPLICATION OF FUSION BEAD CORRECTION IN XRF ANALYSIS OF POWDERS

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The fusion bead method is an effective sample preparation technique for accurate analysis of a wide variety of powder samples by XRF spectrometry including minerals and ores since it eliminates heterogeneity due to grain size effects and mineralogical composition. Analytical errors in the fusion bead method may occur; however, due to loss on ignition (LOI) or gain on ignition (GOI) by the sample during fusion or due to volatilization of the flux unless appropriate corrections are applied for these factors.

There are different types of minerals in iron ores such as hematite ( $\text{Fe}_2\text{O}_3$ ), magnetite ( $\text{Fe}_3\text{O}_4$ ), goethite ( $\text{FeOOH}$ ), and siderite ( $\text{FeCO}_3$ ). Depending on the particular iron minerals present and their relative abundance, LOI or GOI occurs during fusion as reduced iron phases are converted to  $\text{Fe}_2\text{O}_3$ . Some iron ores also contain sizable amounts of water of crystallization that evolves during fusion and contributes to the LOI of the sample. Nickel and copper ores and their concentrates contain large amounts of metal sulfides. Both the metal and the sulfur are oxidized during fusion, resulting in a strong GOI. Additionally, when fusing at high temperature or using a flux with a low melting point, the volatilization of small portions of the flux during fusing cannot be ignored for accurate analysis.

We have developed a unique, universal fusion bead correction method that can conveniently address all of the sources of error described above in an empirical calibration. The method is also able to correct for variations in the weights of sample, flux and oxidizing agent in fusion bead samples, which relaxes the need for accurate weighing of ingredients in routine analysis.

We have tested the fusion bead correction method in the analyses of actual mineral and ores samples and obtained reliable results. We will present results from different application examples using this method.