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## **LIBS Spectral Comparison with XRF Assays for Elemental Characterization of Iron Ore Samples**

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## LIBS Spectral Comparison with XRF Assays for Elemental Characterization of Iron Ore Samples

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### Introduction

LIBS is a rapid multi-elemental technique supporting mineral exploration, ore characterization, and geometallurgical modelling. The correlation between spectral intensity and elemental concentration requires validation with geochemical reference data to ensure calibration.

### Method and/or Theory

This study compares LIBS spectra and X-ray fluorescence (XRF) assays for 76 pressed-pellet samples of friable and compact itabirites and hematites. LIBS spectra were collected in the UV–VIS range and cross-referenced with emission lines from the NIST Atomic Spectra Database. The LIBS is part of the coresampling facility from Geotek at Vale (LEEAP).

### Results and Conclusions

Spectral intensities between 200–300 nm and 370–450 nm — linked to Fe and Si — align with the sample's dominant elements. Fe-rich samples showed higher Fe I and Fe II emissions (248 and 259 nm), while Si-rich ones displayed strong Si I signals (288.14 nm). Despite spectral consistency, LIBS-XRF correlations ranged from poor to moderate, likely due to matrix effects, mineralogical variation, and line overlaps. Al and Mn, though less abundant, showed better correlations with XRF ( $R^2 = 0.81$  and 0.67, respectively). These findings highlight LIBS as a fast, complementary tool to XRF in mining workflows. Further research is advised to improve Fe and Si quantification, using certified reference materials and broader concentration ranges.