



SBGf Conference

18-20 NOV | Rio'25

Sustainable Geophysics at the Service of Society

In a world of energy diversification and social justice

Submission code: 6J5Z80DAGW

See this and other abstracts on our website: <https://home.sbgf.org.br/Pages/resumos.php>

Spectral Validation of LIBS Data Based on Known Mineralogical Composition in Reference

Maria Masella (Geotek do Brasil), Lucas Frascaroli (Geotek do Brasil), Leonardo Soares (Geotek do Brasil), Mateus Martins (Geotek do Brasil), Raphael Prieto (Vale)

Spectral Validation of LIBS Data Based on Known Mineralogical Composition in Reference

Copyright 2025, SBG - Sociedade Brasileira de Geofísica/Society of Exploration Geophysicist.

This paper was prepared for presentation during the 19th International Congress of the Brazilian Geophysical Society held in Rio de Janeiro, Brazil, 18-20 November 2025. Contents of this paper were reviewed by the Technical Committee of the 19th International Congress of the Brazilian Geophysical Society and do not necessarily represent any position of the SBGf, its officers or members. Electronic reproduction or storage of any part of this paper for commercial purposes without the written consent of the Brazilian Geophysical Society is prohibited.

Introduction

Laser-Induced Breakdown Spectroscopy (LIBS) has emerged as a fast and cost-effective technique for elemental analysis in geological materials. However, its application in core logging workflows requires validation through comparison with mineralogical and geochemical reference data to support system calibration and ensure reliable spectral interpretation.

Method and/or Theory

Three representative samples were selected from distinct lithologies: Phyllite, Compact Marble, and Friable Goethitic Itabirite. Each sample had been previously characterized by automated quantitative mineralogy, yielding bulk mineral abundance (BMA, wt%). LIBS peaks were cross-referenced with theoretical compositions from the Webmineral database. The LIBS equipment is integrated into the core scanning facility operated by Geotek at Vale's center (LEEAP).

Results and Conclusions

LIBS spectra closely aligned with each sample's mineralogy. Compact marble showed strong calcium and magnesium emissions, indicating dolomite. Phyllite presented intense signals for magnesium, iron, and aluminium, reflecting Mg-Al phyllosilicates typical of low-grade metamorphic rocks. The goethitic itabirite exhibited high-intensity iron and silicon peaks, consistent with hematite, goethite, and quartz. This agreement between spectral response and theoretical mineral chemistry demonstrates LIBS's capability to reflect mineralogical variation. Findings support the use of LIBS as a complementary tool for lithological characterization and early-stage geochemical assessment in core logging.