Elemental mapping of mineral sample by LIBS

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Palavras Chave: *LIBS, Laser, Elemental mapping*

Introdução

Laser induced breakdown spectroscopy (LIBS) has been used as an analytical tool for determination of elements[1] and mineral[2] analyzes. The aim of this study was to use automatic mapping tools by LIBS in mineral sample to identify the distribution of some elements on the sample surface. The mineral used in this job was Apatite. Apatite is a group of the phosphate mineral and is one of the few minerals to be produced and used by biological systems.

Resultados e Discussão

The tests was performed using a commercially available J200 Tandem LA/LIBS system from Applied Spectra, Inc.. Silicon, Magnesium and Sodium lines was used to detect and to get an Elemental Mapping in the surface. The system was configured with a 25mJ/pulse @ 266 nm laser with 5-ns pulse width, 1–20 Hz repetition rate, spot size adjusted to 40um and a 6 channel CCD-based broadband spectrometers. The gate delay was defined in 0.8us and a single shot was collected. The sample table drive system in positions X, Y and Z have enabled rapid and accurate positioning of samples to achieve the shots. The total data collection time was less than 2 minutes, covering the spectral range between 190 and 1040.

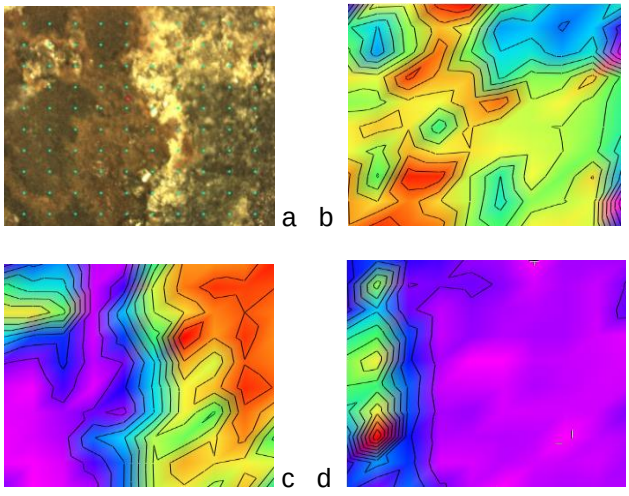

Figura 1.a. Sample view with spot point position.
b. Silicon intensity distribution in the sample.
c. Magnesium intensity distribution.
d. Sodium intensity distribution.

The lighting system and high magnification optical zoom (x60) reveals sample surface.
Viewing the sample and the mappings can be seen the difference in the distribution of sodium and magnesium. The presence of Magnesium is visible when comparing the sample photo and Magnesium distribution.

Conclusões

Analytical techniques such as AAS and ICP-OES can easily quantify elements such as Si, Na and Mg, but destroy the sample and give us concentration of the elements. This work demonstrated that it is possible to determine the 2-dimensional elemental mapping of mineral sample. Additional testing has been performed is the use of multiple shots by position in order to verify the distribution of elements on the sample surface and lower layers. A future work is to quantify the surface distribution and expand to other elements. Rare Earth Elements (REE) will be test in the future.
2-Dimensional elemental mapping can be used for other kind of samples and matrixes.

Agradecimentos

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