



Ensuring Compliance: LIBS as a Tool for Toxic Metal Detection in Glass Printing

Challenges

In today's regulatory environment, industries are under increasing pressure to ensure their materials and processes meet stringent safety standards. Detecting harmful substances quickly and accurately is crucial for compliance and public health. **Laser-Induced Breakdown Spectroscopy (LIBS)** is an advanced analytical method that meets these needs with remarkable efficiency.

Solution

LIBS can be used to detect the presence of toxic metals even in complex materials. For example, when applied to samples of borosilicate glass, LIBS successfully identified the presence of toxic elements such as lead (**Pb**) and cadmium (**Cd**) in one of the samples as shown in the Figure 1 and Figure 2. By utilizing measurements with **Sci-Trace**, it is possible to identify these elements with high precision, based on their distinct emission lines and ease of detection.



Results

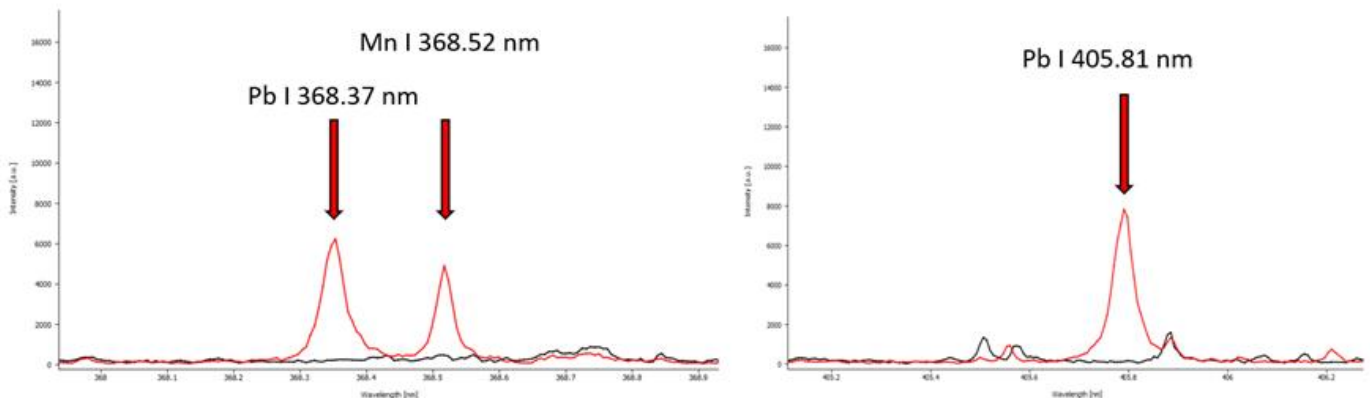


Figure 1: Detection of Pb in certified coating (black line) and non-certified coating (red line)

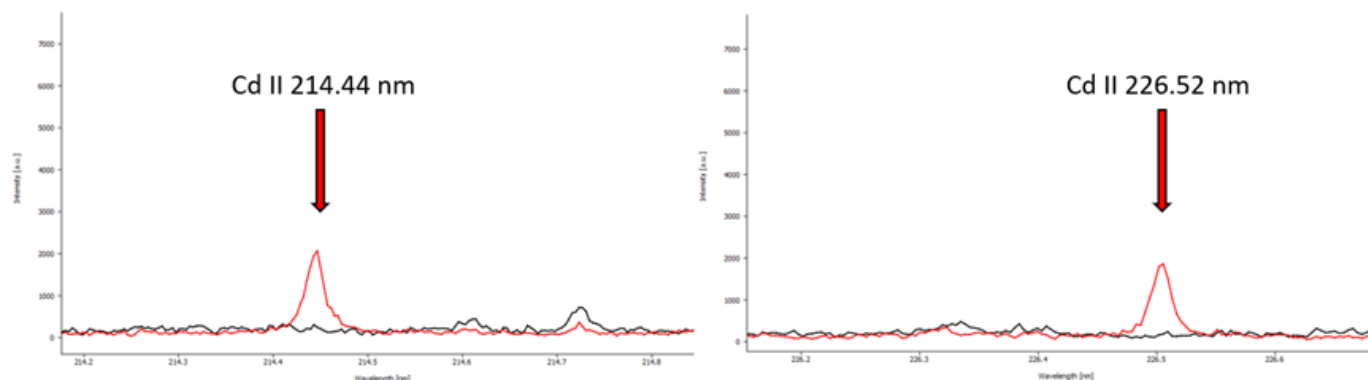





Figure 2: Detection of Cd in certified coating (black line) and non-certified coating (red line)

-  Toxic metals were found not only directly in the print but also in the glass surrounding the printing area. Analysis of the surrounding glass revealed the presence of **lead** and **cadmium** in the non-certified sample.
-  The use of **LIBS** in the glass industry is truly versatile. **LIBS** can be employed to analyze glass composition, identify impurities such as grains or gas bubbles, investigate excluded phases, and more. By detecting toxic metals in glass with this analysis, we have further confirmed the broad applicability of **LIBS** in the industry, not limited to just the glass sector.
-  This analysis highlights the potential for **Sci-Trace** to significantly contribute to the monitoring and regulation of permissible processes in the EU regarding the use of toxic chemical substances. Traditional methods for controlling the presence of prohibited elements, such as lead, are often complex and time-consuming. **Sci-Trace**, however, offers a rapid and effective solution for detecting toxic substances in materials, which makes it a valuable tool for ensuring compliance with safety standards and protecting public health.

LIBS Principles

Laser Induced Breakdown Spectroscopy (LIBS) is an optical emission tool for the quick characterization of chemical elements in a broad range of materials, including biological, geological, and ceramic materials. A highly energetic laser pulse is directed at the target sample (Figure 3), resulting in the creation of an expanding microplasma upon impact. This microplasma emits luminous species that provide valuable information about the material composition and the sample environment.

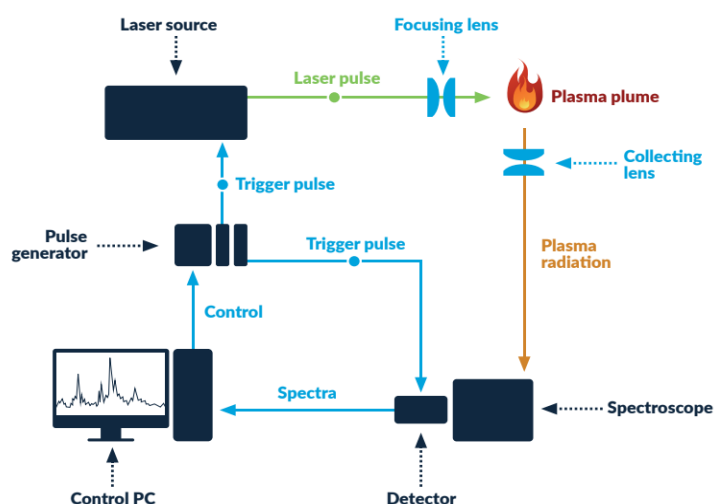


Figure 3: Sci-Trace LIBS set-up scheme