Expanding the Scope of Alloy Analysis: LIBS for Alternative Alloy

Challenges

As industries continue to advance, there is an increasing demand for precise and efficient analysis of alternative alloys. Modern technologies require materials that offer improved performance, durability, and sustainability. However, traditional analytical methods often struggle to keep up with the complexity of these new alloys. Standard techniques can be time-consuming, expensive, and may lack the accuracy needed to handle the increasingly intricate compositions of advanced materials. Thus, a more effective method of analysis is needed to meet the evolving needs of industries.

Solution

To address these challenges, **Laser-Induced Breakdown Spectroscopy (LIBS)** is a suitable analytical technique as it offers rapid, micro-destructive, and highly accurate elemental analysis, making it ideal for the detailed examination of complex alloys. This method allows for real-time data acquisition, minimal sample preparation, and the ability to analyse a wide range of metallic materials.

In this case, a dual system of **nickel (Ni)** and **lanthanum (La)** alloys was specifically analysed using LIBS technology, which provides a means to perform quick semi-quantification of the target elements, facilitating efficient material analysis without compromising accuracy.

Results

Using the **Sci-Trace LIBS instrument**, a detailed assessment was performed, focusing on the rapid semi-quantification of these elements. As shown in Figure 1, clear signals of **Ni** and **La** were successfully detected, and their presence in the measured samples was semi-quantified with ease. These results demonstrate that LIBS can effectively support the analysis of advanced alloys, enabling better understanding and optimization of material properties in various industrial applications.

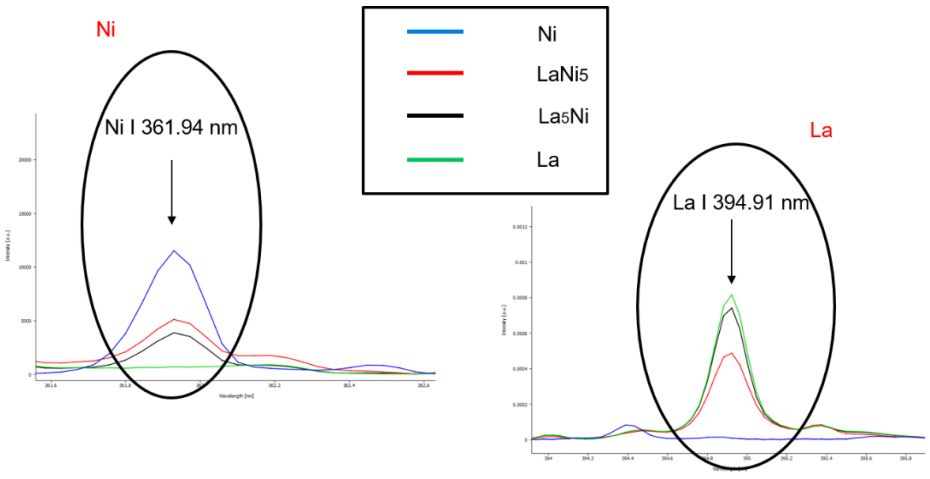
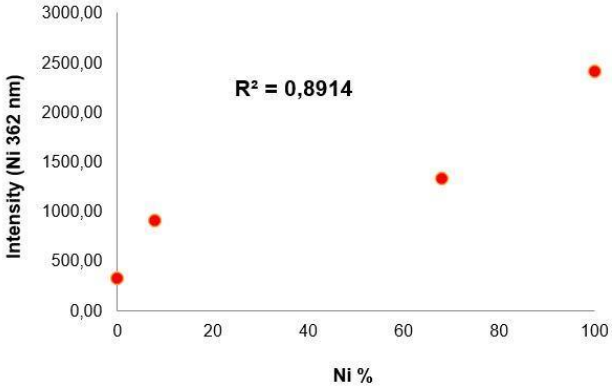


Figure 1: Detection of Ni and La in alloys

Sample	%Ni	%La	Ni 362 INT
La	0	100	322,93
La5Ni	7,8	92,2	903,68
LaNi5	67,9	32,1	1330,33
Ni	100	0	2411,21



Sample	%Ni	%La	La 395 INT
La	0	100	4247 * 10-4
La5Ni	7,8	92,2	3923* 10-4
LaNi5	67,9	32,1	2916* 10-4
Ni	100	0	170* 10-4

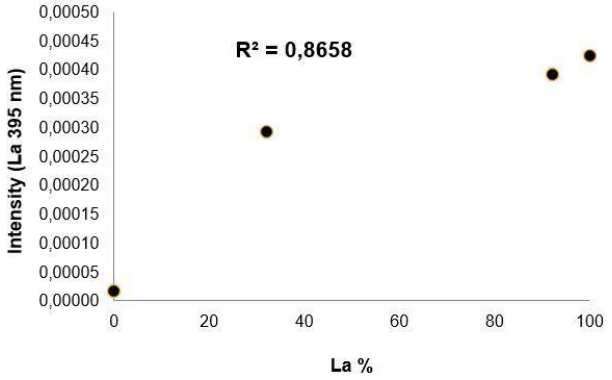


Figure 2: Content of Ni and La

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.

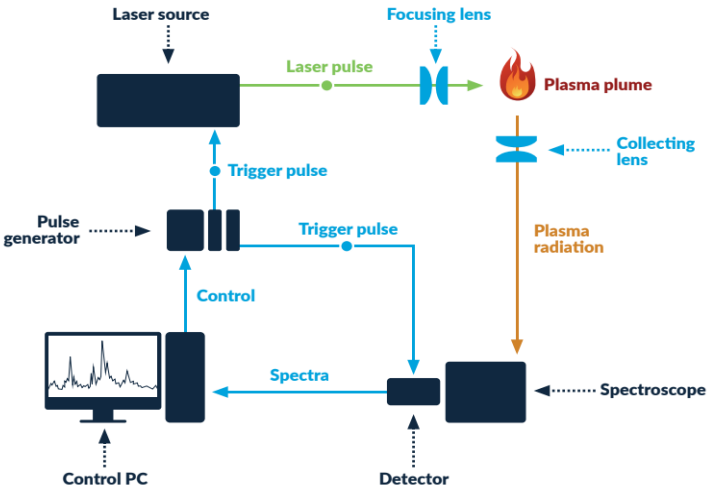


Figure 3: Sci-Trace LIBS set-up scheme

