

Depth profiling of thin Zinc layers on metallic surfaces using Sci-Trace

Laser-Induced Breakdown Spectroscopy (LIBS) is a method that provides fast qualitative depth-resolved analysis of surfaces even in air, i.e. depth profiling typically in micrometric range.

LIBS is readily used for determining the thickness of surface layers and estimating the distribution of elements in individual layers. This is obtained when each laser pulse ablates the material layer in the same interaction region. Conventionally, X-ray fluorescence (XRF) method dominates the quality control of surfaces. But despite its advantages it is unable to accurately estimate the layer thickness and selectively determine presence of elements in individual layers.

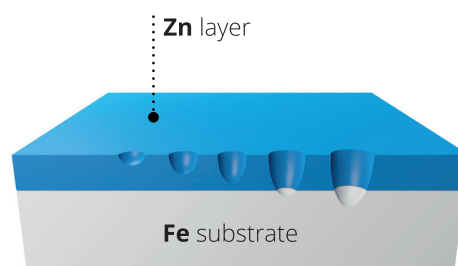


Fig. 1: Laser ablation of individual layers.

In AtomTrace we developed methodology applicable to depth profiling of sample surfaces:

- Determining the thickness of layers with a sufficient depth resolution.
- Determining all elements in the sample material, even the light ones (Li, Mg, Na, etc.).
- Operating during atmospheric conditions, thus suitable for direct industrial quality control.

- Both conductive and non-conductive samples can be analyzed.
- The system performance can be varied and the resulting pulse to pulse in-depth average ablation rate can range from 0.1 to units of micron.
- The LIBS method is suitable also for 3D analysis (in-depth mapping), revealing the fluctuation in transition layer depth.

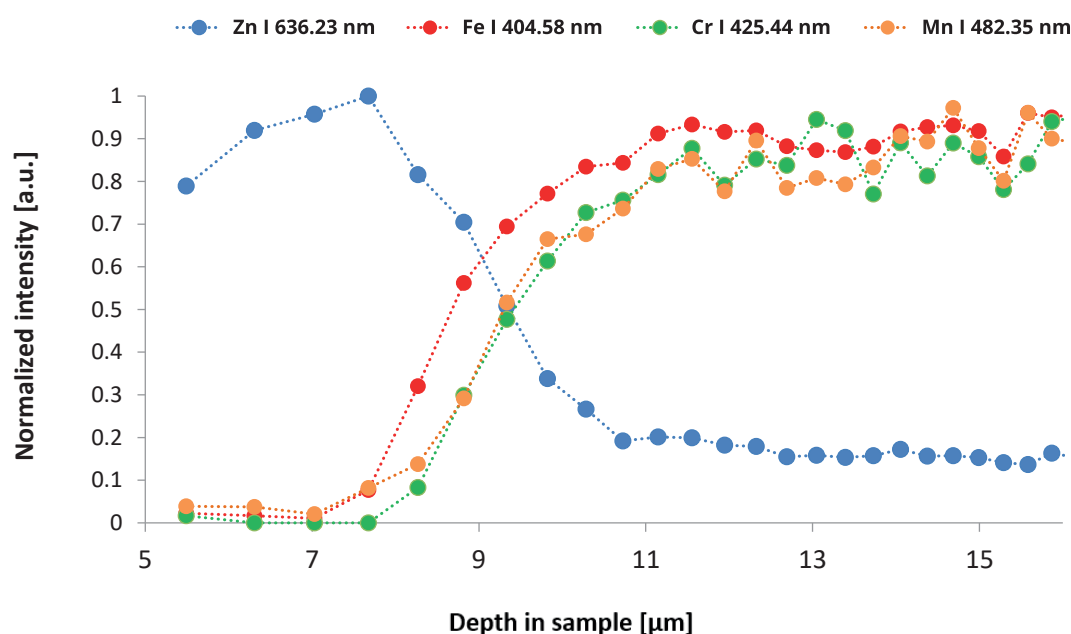
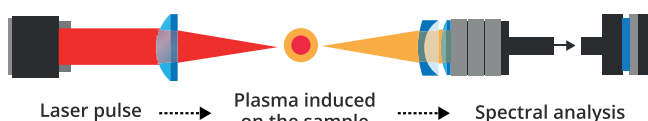


Fig. 2: Depth profile of the Zn-coated steel: the distribution of elements depending on the depth.

LIBS measurement with the Sci-Trace

Laser-Induced Breakdown Spectroscopy (LIBS) is a modern and flexible analytical technique. It is a combination of laser ablation and atomic emission spectroscopy. Pulsed laser rejects a small part (down to few nanograms) of analyzed material and creates a microplasma.



Spectral analysis of the laser-induced plasma radiation provides a qualitative and quantitative data about the chemical composition of the analysed sample.

It is possible to analyze solid, liquid or gaseous samples without any special sample preparation in a matter of seconds.

LIBS is sensitive to the majority of chemical elements, including light elements, with limits of detections as low as about 1-10² ppm.

Measurements from this application list were performed utilizing the **Sci-Trace** - configurable analytical instrument specialized on the LIBS technique.

Sci-Trace is designed by scientists for scientists and can be configured to meet the requirements not only of novice or experienced LIBS researchers but also of any analytical laboratory user. Sci-Trace is easily extendable with a number of specialized modules, therefore it is always ready for experimentator's diverse ideas.

Sci-Trace includes advanced spectra processing software: the **AtomAnalyzer**.

