

Bioimaging of rice tissue with the use of a laser ablation system coupled to the Agilent 7700x ICP-MS

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Introduction

The combination of a laser ablation (LA) system with ICP-MS has been developed over the last years for the direct analysis of solid samples with almost no sample preparation. More recently, this technique has been deployed to study the metal distribution in biological samples. Indeed, the analysis of tissue section using LA-ICP-MS enables the generation of pictures showing the element pattern in the sample. In the present works, the application of LA-ICP-MS has been deployed on a rice grain to study its element distribution.

Sample preparation

Rice seeds has been analyzed along their width. The sample has been first fixed on paraffin, then, cut along its width. This section was ablated by LA-ICP-MS system. The bio-imaging pictures were generated with the software developed by Philip Doble from UTS, Australia [1].

Experimental

A laser system from NewWave (NWR-213) was used for ablating the samples. The laser is working at a wavelength of 213 nm. The exit of its cell, where ablated material is sampled, is directly linked to the 7700x ICP MS from Agilent.

The settings used for the laser are summarized in the Table 1.

Parameter	Value
Scan speed	30 $\mu\text{m/s}$
Energy	100%
Frequency	20 Hz
Spot size	10 μm
Helium flow	0.8 mL/min

Table 1 Parameters used for the ablation of the sample

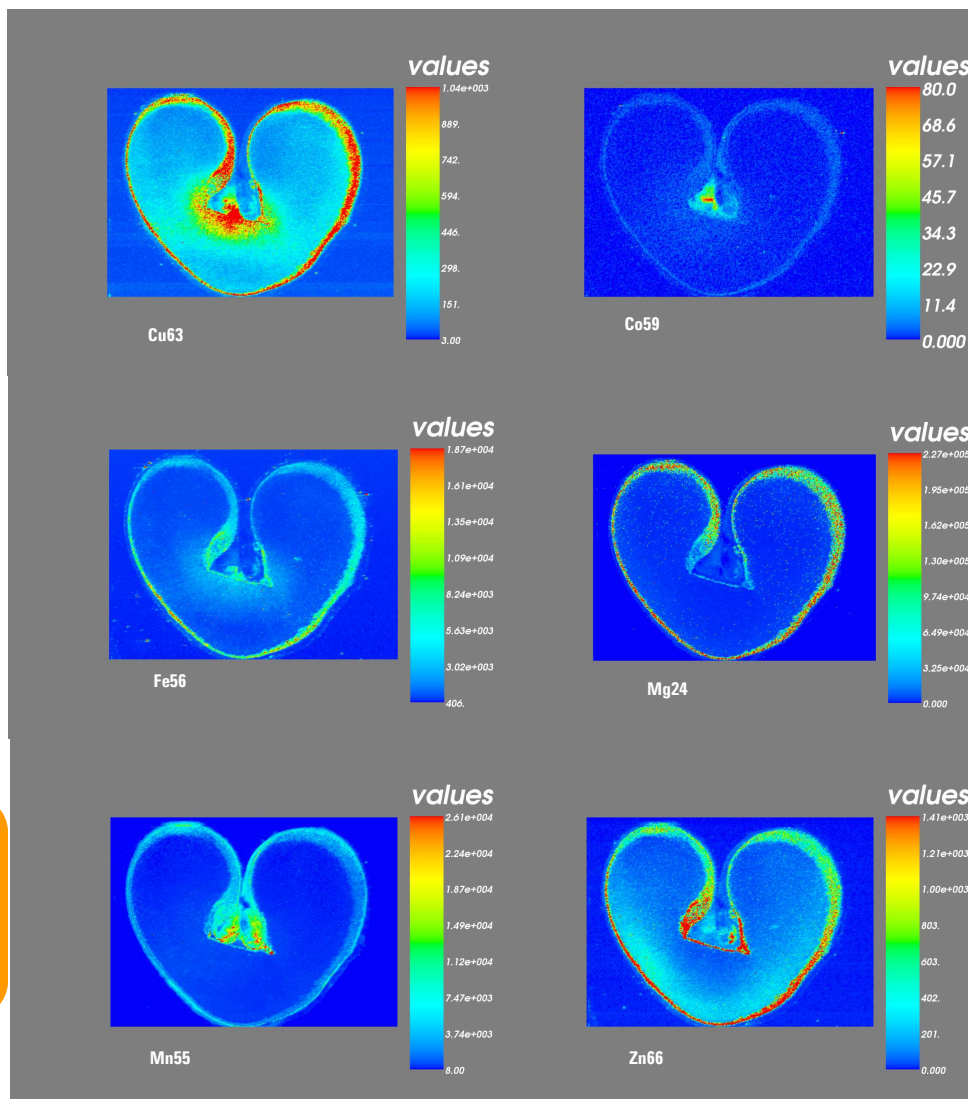
Before operating on environmental samples, instruments are optimized with the NIST-612 glass sample. Sensitivity, but oxide ratio, doubled charged and isotope fractionation are daily tuned for achieving the best performances of both instruments. The optimization of the ICP-MS is controlled by the software MassHunter (torch position, flow of gases...).

General settings applied to the 7700x are summarized in Table 2.

Parameter	Value
Plasma power	1400 W
Carrier gas	0.49 l min ⁻¹
Sample depth	6 mm

Table 1 - 7700x parameters for the analysis of diluted samples

Results



Qualitative data for elemental distribution within the rice width

Conclusions

The coupling of LA-ICP-MS was successfully applied to the analysis of element distribution within a sample, enabling the localization of the element.

The next step for such analysis will be the quantification of those element distributions.

References

- [1] D. Hare, J. L. George, R. Grimm, S. Wilkins, P. A. Adlard, R. A. Cherny, A. I. Bush, D.I. Finkelstein, P. Doble. *Metallomics*, 2010, 2, 745-753.