

## LASER ABLATION - ICP - MASS SPECTROMETRY (LA-ICP-MS) BIO-IMAGING: MAPPING THE SPATIAL DISTRIBUTION OF (TRACE) ELEMENTS IN BIOLOGICAL TISSUES WITH MICROMETER-SIZED RESOLUTION

### INTRODUCTION

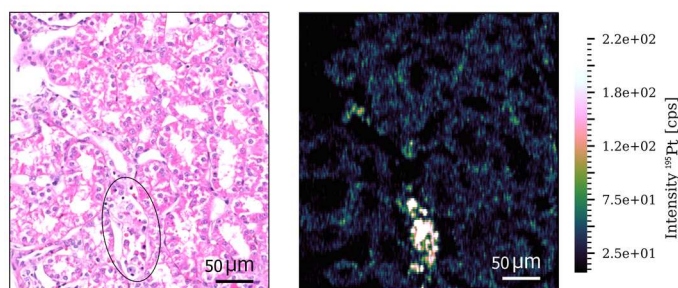
ICP-mass spectrometry (ICP-MS) is an ideal tool for (ultra)trace element analysis, combining extremely low limits of detection and a wide linear dynamic range with multi-element capabilities. In its standard configuration, ICP-MS is intended for the analysis of aqueous solutions, requiring solid samples to be digested. The use of laser ablation (LA) as an alternative sample introduction approach, however, permits the direct bulk and spatially resolved element analysis of solid materials. LA-ICP-MS is very well suited for quantitatively documenting the distribution of mineral elements across biological tissues.

### TECHNOLOGY

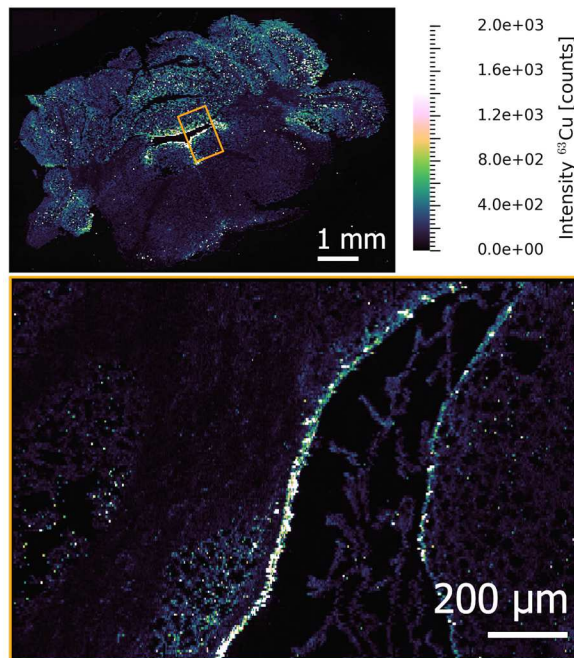
The AGMS research unit of the Department of Analytical Chemistry at Ghent University is specialized in the determination, speciation and isotopic analysis of (trace) elements using ICP-mass spectrometry. The unit houses 6 ICP-MS instruments with different capabilities and 2 deep-UV LA-units. For LA-ICP-MS applications, our researchers have developed an aerosol rapid introduction system (ARIS, commercially available), together with an ultrafast ablation cell (patent pending). This cell provides even better limits of detection and an enhanced spatial resolution (1  $\mu\text{m}$  under optimum conditions; there is a trade-off between spatial resolution and sensitivity). For less demanding LA-ICP-MS applications (i.e. at lower spatial resolution), this cell significantly enhances sample throughput and thus reduces the cost of analysis.

### APPLICATIONS

- Trace element fingerprinting
- Quantitative bulk analysis
- Depth profiling analysis
- Mapping of 2-D or 3-D elemental distribution
- Spatially resolved isotopic analysis



The distribution of Pt (under the form of a chemotherapeutic drug) across cortical kidney tissue (right) and an H&E stained adjacent tissue slice (left).



The distribution of Cu in a coronal cross-section of a mouse brain, with a zoomed in region around the choroid plexus.

#### ANALYTICAL FIGURES OF MERIT

- Wide elemental coverage
  - Practically all elements of the Periodic Table
  - No H, C, N, O, F
- Multi-element capabilities
- High sensitivity
  - (Sub-)ppm limits of detection
  - Trade-off between spatial resolution, sensitivity and speed.
- High spatial resolution
  - 1 – 250  $\mu\text{m}$  laser beam diameter
- Quantitative elemental concentration data

#### ADVANTAGES

- Expert team with >15 years of experience with LA-ICP-MS
- State-of-the-art infrastructure
- High sample throughput in routine applications
- Cost-efficient workflow
- Faster and reliable reporting based on in-house developed software
- Facilities for complementary solution analysis

**We are seeking for partners interested in LA-ICP-MS based projects or for researchers and companies interested in bio-imaging services of biological tissues or trace element mapping in other (non-biological) materials.**

## CONTACT

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