

Licensing Opportunity

Downward ICP mass spectrometer for the analysis of cells and particles

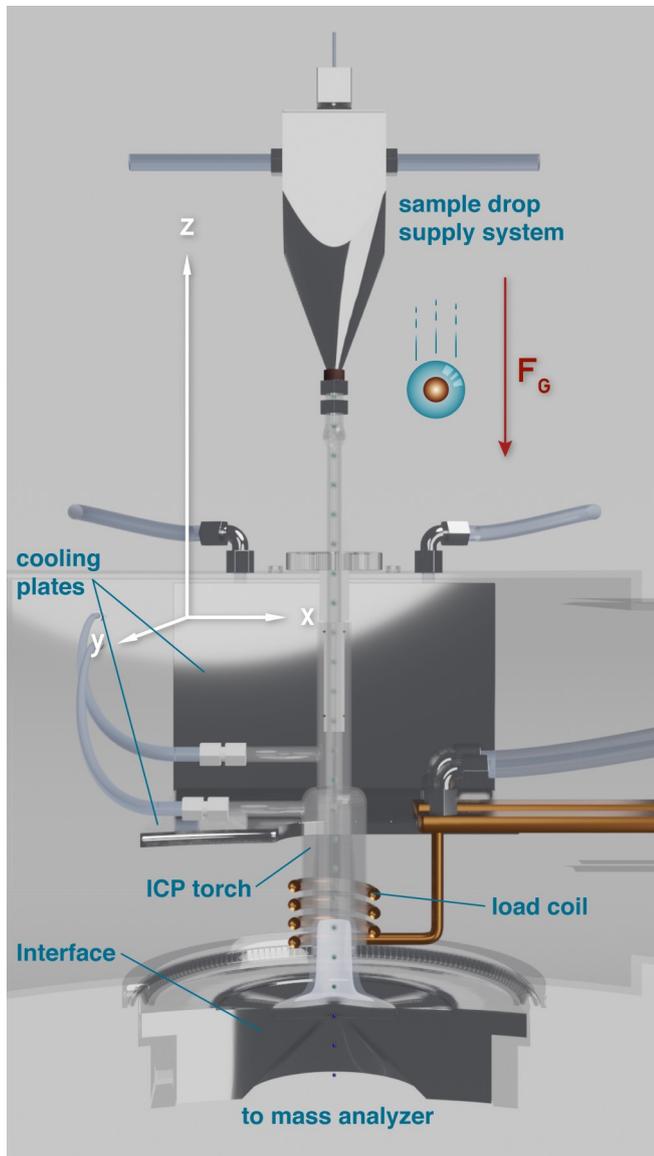


Fig. 1 Schematic of the downward ICP equipped with a sample inlet on the top. Droplets are dispensed on-axis into the plasma.

Application

A downward-pointing vertical Inductively Coupled Plasma Mass Spectrometer (ICPMS) enables loss-less transfer of micron-sized droplets of arbitrary size distribution for the analysis of individual cells of any type.

Features & Benefits

- Sample introduction efficiency independent of size and size distribution of the sample aerosol
- Simple coupling to cell/particle sorting systems
- Continuous sample supply
- Flexible optimization of the operating conditions of the ICPMS ion source

Background

In commercially available ICPMS instruments, the sample inlet is commonly oriented horizontally. As the efficiency of droplet/particle transmission to the ICP ion source depends on its mass, heavier droplets/particles follow different trajectories than lighter ones and settle more easily because of gravity. Therefore, current sample introduction systems show limitations regarding droplet/particle size as well as throughput.

Invention

In a downward ICP, the direction of the sample trajectory aligns with the gravitational force vector so that gravitational settling during aerosol transfer remains absent. This reduces the complexity of the sample transport and is especially advantageous for analyzing suspensions of (sub-) micron-sized objects such as particles and biological cells carried in droplets as well as improving the sample throughput. Independent of size and mass, the sample object gets transported into the plasma. The downward ICP was further equipped with an integrated heat management system that prevents damage of the ascending heat to the torch, the load coil and the gas supply.

Publications

- patent pending
- T. Vonderach, B. Hattendorf, D. Günther, "New Orientation: A Downward-pointing Vertical Inductively Coupled Plasma Mass Spectrometer for the Analysis of Microsamples", *Anal. Chem.* 2021, 93, 2, 1001–1008 <https://doi.org/10.1021/acs.analchem.0c03831>

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Technology Readiness Level

