Advanced technology for high throughput LA-ICP-TOFMS element imaging

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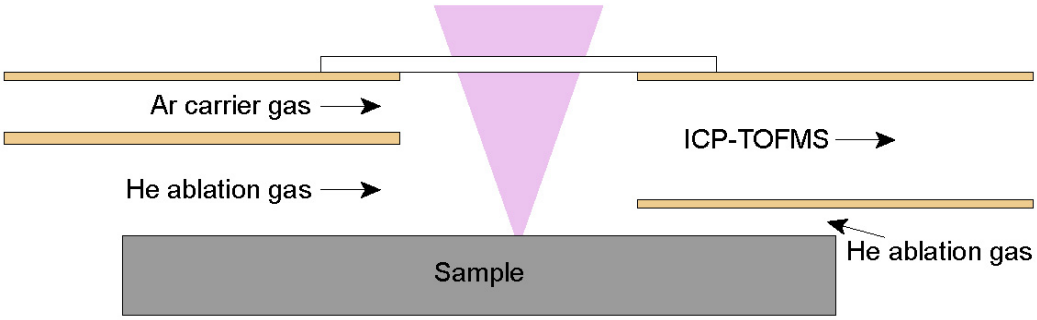
Laser ablation inductively coupled plasma time-of-flight mass spectrometry (LA-ICP-TOFMS) element imaging provides valuable information of the distribution of major to trace elements within solid materials. For example, the element distribution can give insights into geological processes and genesis of minerals and rock formations.[1]



Here, we present the parallel flow ablation cell (PFAC) in combination with the imaging control system (ICS) to increase the throughput and applicability for element imaging. The PFAC is a modification of the tube cell design[2] and allows fast and reliable aerosol transport. The signal duration of 0.25 ms (full width at 10% of the maximum) is the shortest achieved so far for laser ablation sample introduction and ICP-MS detection. The ICS synchronizes the control of the translation stage, the laser and the TOFMS data acquisition and therefore allows an almost automated analysis. In addition, the combined control of the three devices allows the imaging of custom ablation area masks fitting the sample structure. Multiple laser pulse patterns can be chosen according to the application. For example, a single pulse mode can be used for fast scanning of the area of interest or a hole drilling mode to achieve lower limits of detection. The triggered data acquisition for every ablation position led to binned pixel data in relation to the sample position. This simplifies the data evaluation and allows a more automated image generation, and reduces the time for data evaluation. The capabilities are exemplified by the measurement of common reference materials for LA-ICP-MS and by quantitative element imaging of geological samples.

[1] V.M. Goldschmidt, *Geol. Mag.* **1937**, *74*, 9, 428 – 429.
[2] H. A. Wang, D. Grolimund, C. Giesen, C. N. Borca, J. R. Shaw-Stewart, B. Bodenmiller and D. Gunther, *Anal. Chem.* **2013**, *85*, 10107-10116.