Fast high resolution imaging of sphalerite with icpTOF

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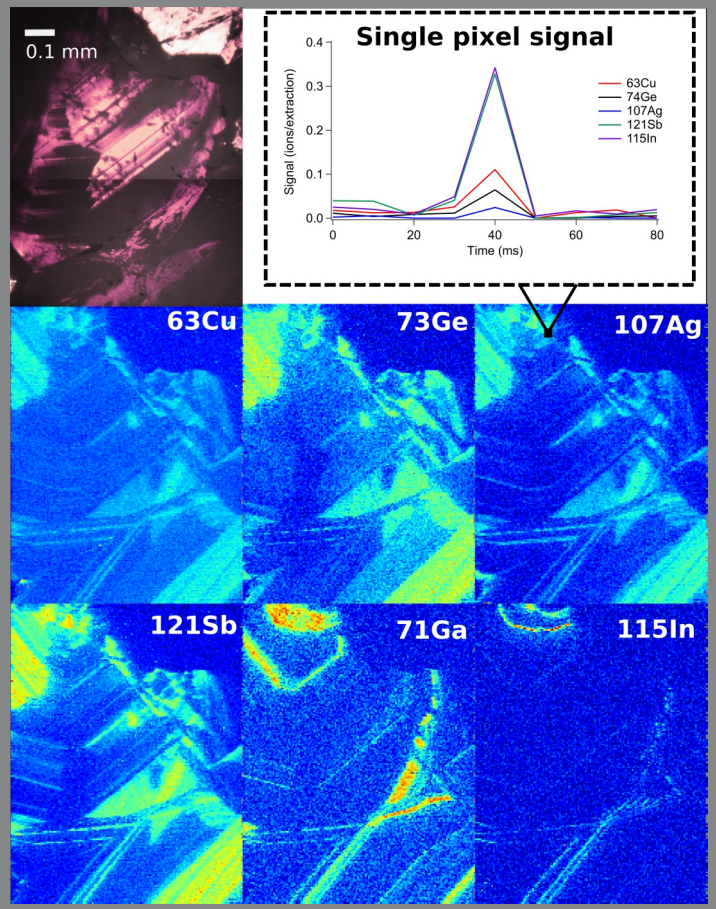
icpTOF

High resolution elemental imaging by LA-ICP-MS can provide more insights into geological history of minerals.

Most current methods for elemental mapping by LA-ICP-MS use quadrupole or sector field mass analyzers that sequentially measure each isotope of interest at each "pixel" in the imaged 2D area. Because measurement time increases linearly with the number of elements recorded, researchers must carefully define which elements to measure for an unknown sample.

The TOFWERK icpTOF uses a time-of-flight mass analyzer that simultaneously measures all isotopes at high speed. It is therefore well-suited for coupling to new laser ablation chambers that generate very short plumes of aerosols per laser pulse and provide higher S/N and imaging speed. This works demonstrates fast mapping of Ge-rich sphalerite at 5 µm resolution using the icpTOF and the recently developed Dual Concentric Injector from ESI. Where standard setups have to step across pixels to obtain a pixel-resolved image, this configuration is able resolve pixels while running in the fastest possible continuous scanning mode and recording a complete mass spectrum at each pixel.

In combination with the latest laser ablation technology, the icpTOF can image geological samples at 10x the rates of standard instruments - recording all elements at each pixel with no carryover between successive pixels.



Optical and LA-ICP-MS intensity images of Ge-rich sphalerite [This sample was characterized in R. Belissont et.al. Geochimica et Cosmochimica Acta, 2014, 126, 518-540]. Using the icpTOF with the Dual Concentric Injector (ESI), an area of 750 µm x 1000 µm was mapped at 5 µm resolution in only 50 min, with a complete mass spectrum recorded for each 5 µm pixel. Ablation was performed at 10 Hz laser frequency, continuously scanning over lines at 50 µm/s. Each laser pulse produced a 100 ms transient signal, and adjacent pulses were easily resolved from one another. icpTOF acquisition was synchronized with the pulsing of the laser (one pulse/pixel). The transient signals recorded for several isotopes at a single pixel is shown on the top.

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