SelfSeal sample chamber: Automation for industrial bulk analysis

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Elemental analysis to support mineral exploration requires accurate, precise and low detection limits, with an ability to meet high sample throughput demands. With respect to analytical figures of merit, LA-ICP-MS is an excellent fit. However, the current level of human intervention limits its ability to meet throughput requirements and thus the technique has not been widely adopted in the industry.

The most common approach for improving LA-ICP-MS throughput is to utilize large sample chambers that are capable of holding a large number of samples at a time. This approach is non-ideal, however, as simply utilizing a large sample chamber fails to address the time and human involvement of placement of samples, purging, and focusing scans. Depending on the samples, this can take nearly as long as the analysis itself.

Additionally, recent studies have demonstrated that increasing the sample chamber dimensions without accounting for gas flow dynamics can either dramatically increase the purge time (actually decreasing throughput) or decreasing positional reproducibility (increasing error) [1]. Even large sample chambers that are capable of rapid, efficient purges, such as the TwoVol2, require manual placement of samples and focus adjustments. Samples may also be cut, to increase the volume per batch, but this adds sample prep time and makes traceability more complex.

To reduce the time and human involvement between analyses, ESI has developed the SelfSeal sample chamber, specifically for true high throughput sampling of industrial materials. The SelfSeal chamber requires no focusing time, no pattern adjustment, has a purge time of under 7 seconds, and maintains the positional stability and sensitivity expected of LA-ICP-MS. Here we demonstrate calibration curves on real XRF standards and repeatability figures on NIST glass, as well as providing a full analysis time from sample introduction to sample removal and realistic estimates of maximum samples per day.

[1] ESI Technical Note: NWR025 Comparison of Laser Ablation Cell Purging Techniques