STDGL3 – a new calibration standard for sulphide analysis by LA-ICP-MS

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Laser-induced fractionation during ablation is matrix dependent [1] requiring matrix-matched calibration standards for quantitative analysis. This is a particular challenge for sulphide minerals, as natural and/or fabricated sulphides have limited number of elements distributed homogenously. The use of powdered sulphide mixes (e.g., MASS-1; [2]) is limited by their heterogeneity and lack of long term stability. Lithium-borate based glasses with dissolved sulphides have been shown to be better standards than silicate glasses (e.g., NIST glasses) [3], although the heterogeneity of a range of elements remained an issue. We have used Li-borate based flux doped with a wide range of chalcophile and siderophile trace elements, and also elements required for assessing common interferences (e.g. Gd, Hf, Ta, W, Zr, Sr). The doped flux was fused with a mixture of Fe- and Zn-rich sulphide powders to produce a homogeneous glass. A preparation procedure was developed to ensure sufficient mixing while retaining volatile elements (Se, Tl) and preventing Au and Pt from forming micro inclusions. The glass produced can be used as a calibration standard for LA-ICP-MS analysis of sulphides, and is characterised by improved homogeneity. The homogeneity (RSD) at 50 um spatial resolution for most elements are below 3%, below 5% for Au and Pt, and below 7% for Se.

Ablation of different sulphide minerals results in a variable degree of fractionation between metals and sulphur [4], and also between volatile and refractory metals (e.g., Zn, Cd, W relative to Fe; [3]). Therefore, correction factors should be applied when analysing different sulphides using STDGL-3 as a calibration standard. The correction factors for STDGL-3 were assessed against pressed pellets of finely ground sulphide mixes (<5 micron) using nano-second pulse width laser ablation systems: a range of 193 nm lasers with variable pulse widths, a 213 nm Nd:YAG laser, and a 248 nm excimer laser.

STDGL3 will be available on demand for use in LA-ICP-MS laboratories analysing sulphide minerals.

[1] Gunther et al., 2005. TRAC, v.24 (3), pp. 255-265. [2] Wilson et al., 2002. JAAS, v.17, pp.406–409. [3] Danyushevsky et al., 2011. GEEA,. v.11, pp. 51-60. [4] Gilbert et al., 2014, JAAS, v.29, pp.1024-1033.