Laser ablation mass spectrometry in ore deposit research

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Laser ablation mass spectrometry is an increasingly useful technique which can be used for research into ore deposit genesis, geochemical exploration targeting and metallurgical ore studies into the siting and deportment of various beneficial and deleterious elements. The technique is currently taking ore deposit trace element geochemistry beyond the traditional one-metre assays into a holistic understanding of the distribution and apportioning of elements (and in some cases isotopes) between different minerals at the millimetre to submicron scale. It has the potential to be expanded to the centimetre to metre scale once data handling and reduction issues are resolved.

This review of the ore deposit application of the technique briefly examines a number of novel applications that have recently been tested. These include:

- Multi-trace element mapping of ores from complex gold deposits.
- Gold deportment and gold-rich inclusion size determinations in Archean gold deposits.
- Epidote and chlorite geochemistry in the geochemical halos around porphyry deposits.
- Pyrite geochemistry around orogenic and volcanic-hosted massive sulphide.
- Lead isotopic determination in pyrite to unravel the timing of ore genesis in unconformity uranium and orogenic deposits.
- Rhenium element trace element mapping of pyrite to help with interpretation of rhenium-osmium geochronological data.

Despite the enormous potential of the technique there remain a number of challenges related to analysis and the quantification of laser ablation data including accurate prediction of argide and oxide interference across the mass range, matrix corrections as the laser travels from one mineral to another, and cross contamination of elements between the different minerals and samples. These problems are by no means insoluble but at present require careful interpretation of the data currently being produced as well as experimentation so that our understanding of this technique increases in the future.