Laser sharp focus


Andrew Somers using the Z500 for rock analysis.

BY CHRIS THURMOTT

Towards the end of last year a lot of buzz was being generated about the emergence of a new handheld product that would be able to assay for lithium in the field.

Handheld assay technology, such as a handheld XRF, has been around for the best part of 20 years but has always been limited by what it can read.

Anything lighter than chlorine or magnesium in some newer models and the product was simply unable to conclusively confirm what is in the soil. It could give an indication about what was there but indications can prove costly, especially if that means assaying the entirety of a drill hole, blanks and all.

New technology utilises laser-induced breakdown spectroscopy (LIBS) and has been in development for the geochemical analysis of lithium with US-based SciAps Inc (SciAps), a field portable analytical product manufacturer, and Lithium Australia (LIT) working in collaboration for the past two years.

LIBS is a new type of analytic approach; it is able to detect very light elements such as boron, beryllium and lithium. It is a small sub 2kg handheld device that runs on batteries and has a very similar makeup to that of a portable XRF. It has a relatively low-powered laser beam which is directed onto the sample and creates plasma. The analyser collects emitted light from the plasma and produces a spectrum from which peaks associated with constituent elements can be observed and measured.

"The elemental capabilities of the LIBS augment and go beyond what a portable XRF can produce in terms of elemental range but I think there still is a place for complementary analysis between the two tools," SciAps Global Business Development Director for Geochemistry Andrew Somers said.

"I believe LIBS is the next generation in the evolution of field portable analytical tools but I still think there's a lot of strength in using multiple analytical tools and cross comparing the data. You get a better final result than you do just by using one just in isolation over another."


Adrian Griffin.

Despite this product having exciting prospects for in field exploration and testing, it is not in the position to completely remove the laboratory from the equation. What it does allow is exploration and mining companies to pre-screen samples to better direct their assay budgets and make decisions in real time in the field.

"If we have the right geology and we have a lithium number generated in the field, we will send it away for assay for confirmation," LIT Managing Director Adrian Griffin said.

"If we've got the wrong geology and no lithium or even if we've got the right geology and no lithium then we won't send it away. It means you're not assaying all the blanks."

One of the reasons LIBS is so effective at reading the light elements is because it is able to pinpoint specific areas for analysis. It is able to assay about 0.2 of a cubic centimetre as the laser can pinpoint down to 50um spots within in a 2sq mm area.

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With this pinpoint accuracy comes great responsibility, especially when it comes to sample presentation. Mr Griffin said if the sample presentation was not done properly, it was just as likely salt from a fingerprint would get analysed instead of the minerals in the soil from the drill hole.

"The spot you assay is only a couple of millimetres and you're getting down to just a couple of microns, it's probably less than one 1000th of the volume that you're shooting with a handheld XRF," he told *National Mining Chronicle*.

"You need to look at the number you get back in a subjective manner, make sure it makes sense with what you're trying to achieve and make sure you prepare the sample the right way to get the correct result. If you do all of those things, then you get very good reproducible results."

This technology has the capability to save an enormous amount of time and money when assaying for minerals, especially lithium.

"It is able to generate direct lithium assays in real time in the field. Visually being able to see if there is lithium or not will maximise the drill result. That will have a very large impact in terms of dollars and efficiency of running a programme of that type," Mr Griffin said.

The cost of buying a commercial unit is estimated to be between $50,000 and $60,000, similar to the price of a top of the range portable XRF and Mr Griffin believes this will be money well spent.

"Given the amount of money you save in terms of drill efficiency per project, you might recoup the costs in a single drilling programme. Its only a couple of drills holes you've got to save," he said.

The future for LIBS

Other than just searching for assays within samples, the future for the LIBS technology has some fairly wide ranging applications.

"We are looking at agricultural applications, pharmaceuticals, scrap metal recycling and electronics scrap recycling where we are using the technology to identify what metals are where within circuit boards and electronic micro components in order to recycle them effectively," Mr Somers said.

The electronic scrap recycling is reliant on a fingerprint library of elements being created with the help of LIBS. It has some spectral features that can produce a geochemical fingerprint of a rock or mineral, which can then be used to identify the rock type or mineral species in future explorations.

"This is something that is of real interest to us; doing a qualitative spectral fingerprint library where you can shoot minerals and identify them based on the chemical fingerprint," Mr Somers said.

Despite the technology not being able to remove the laboratory from the assaying equation at this stage, there are definite plans in place to improve the LIBS to a point where there is less reliance on the laboratory for a variety of techniques.

This technology is changing the way things are done but it will not happen overnight. It has taken two years to get to this point and it will be a while before it can fully compete with the portable XRF in terms of calibration capabilities. Despite this, there is a light at the end of what has been a very dark tunnel for the mining industry and it is burning bright. NMC