Improved High Speed Imaging by LA–ICP–MS When Using Fast Response Ablation Cells

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Imaging of elemental and isotope ratio variations in geochemical samples by LA–ICP–MS has been applied effectively to a range of useful applications [1][2][3]. Due to the extended response time of the laser ablation cell, dispersion during sample transport, and the sequential data collection of the most commonly available ICP–MS instruments, such as quadrupole or single-collector sector-field instruments, the time required to collect imaging data can be protracted [4] or even prohibitive. To reduce the data collection time, recent efforts in the field [5] have resulted in a proliferation of commercially available fast-response ablation cells .

Using fast-response ablation cells with sequential ICP–MS instruments can result in a range of deleterious factors: raising the repetition rate to produce a continuous signal can remove too much material too quickly from the sample, or exceed the capabilities of the laser ablation hardware; at intermediate repetition rates aliasing (also referred to as “spectral skew”) between the laser repetition rate and the measurement cycle of the mass spectrometer will produce unwanted artefacts [6] in the resulting image; an inability to control phase between the two systems can result in measurement of some masses taking place when the time-variable signal is low, thus increasing measurement noise; a randomly determined starting phase between the two instruments will result in the operator observing aberrant mass bias which may result in erroneous detuning of the ICP–MS.

One solution to these problems is to use an instrument capable of simultaneous data acquisition, such as a time of flight ICP–MS. For those workers utilising the more commonly available sequential instruments, we will present a novel and effective method to improve high speed imaging by LA–ICP–MS with fast response ablation cells.

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