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Off-axis: Enhanced Dispersion Quad in the Thermo Scientific Neoma MC-ICP-MS for U-Pb, U-Th and Re-Os analysis using multi-ion counting.

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Isotope ratio measurements of the very smallest signals cannot be achieved with analog Faraday cup detector technology, instead a digital ion counter, such as a secondary electron multiplier (SEM), must be used. The Thermo Scientific™ Neoma™ MC-ICP-MS can be fitted with a Multi Ion Counting (MIC) array to allow simultaneous detection of the lowest abundance ion beams [1]. Up to 11 ion counters, with a maximum of three full sized-SEM and eight Compact Discrete Dynodes (CDD) can be added to the typical mobile array of Faraday Cup detectors. These detectors combine low-noise with excellent linearity and stability.

However, the addition of an MIC array to a MC-ICP-MS is not without its challenges. Due to their larger size, the full-sized SEM occupy fixed locations within the detector array, reducing flexibility. The smaller CDD can be made mobile by attaching them to a mobile Faraday cup detector, but their larger size still introduces limits on masses can be used in each detector. As a consequence, traditionally a MIC array could only be used for the single application for which it was designed, such as U-Pb geochronology. Compared to the its predecessor the Thermo Scientific™ Neptune Series™ MC-ICP-MS, the Neoma MC-ICP-MS can be equipped with an enhanced dispersion quad lens. With an order of magnitude, more dispersive power, and the capability to change the position around which the dispersion occurs, the enhanced dispersion quad lens allows a single MIC array to be used for different applications.

Here we report our investigations into using a Neoma MC-ICP-MS with an ESL™ imageGEO™ 193 nm excimer laser ablation system and TwoVol3™ ablation cell to measure U-Pb, U-Th and Re-Os using a single MIC array. Ratios are reported for a variety of common reference materials.

[1] Thermo Fisher Scientific, 2020, BR30600-EN 0520C: Neoma Multicollector ICP-MS [pdf], Thermo Fisher Scientific.