

Incredible or Impossible? Defining the limits of what is possible for MC-ICP-MS/MS with the Neoma MS/MS MC-ICP-MS.

GRANT CRAIG¹, MARKUS PFEIFER², CLAUDIA BOUMAN² AND NICHOLAS S. LLOYD²

¹Thermo Fisher Scientific

²Thermo Fisher Scientific (Bremen) GmbH

The last ten years has seen the re-introduction of collision/reaction cells (CRC) to multi-collector inductively coupled plasma mass spectrometers (MC-ICP-MS): this coming after a decade-long hiatus after the discontinuation of the GVTM Isoprobe-PTM [1]. Alongside the CRC, we have seen the addition of pre-filters, originally quadrupole-based on the Thermo ScientificTM ProteusTM [2] and later the patented [3] combination of a MC-ICP-MS with collision/reaction cell and dual Wien-based pre-cell mass filter on the Thermo ScientificTM NeomaTM MS/MS MC-ICP-MS [4]. For all the impact these new technologies have had, the list of applications using these technologies currently in the literature is short, with most publications focused on just three isotopic systems: Ca, K and Rb/Sr. As such the application space beyond Ca, K and Rb/Sr has not been fully explored.

Here we report on recent experiments using the pre-cell mass filter and collision/reaction cell of the Neoma MS/MS MC-ICP-MS for less explored isotopic systems, including, but not limited to, Ba, ⁹⁰Sr, Ti and Se. We explore how method development differs from single-collector ICP-MS/MS due to the inability and undesirability of single mass transmission into the CRC. The technical capabilities of the dual Wien-based pre-cell mass filter were explored and used to determine which theoretical applications were possible and which were not. Furthermore, knowledge of these technical capabilities was used to arrive at the most optimized methods for the isotopic systems explored.

[1] Li, Beard & Li (2016), *J Anal At Spectrom.* 31, 1023–1029.

[2] Lewis, Luu, Coath, Wehrs, Schwieters & Elliott (2022), *Chem. Geol.* 614, 121185.

[3] Schwieters & Jung (2022), EP3769334B1 Mass Spectrometer.

[4] Cruz-Uribe, Craig, Garber, Paul, Arkula & Bouman (2023), *Geostand. Geoanal. Res.* 47, 795–809.