

Performance of a high resolution, multi-collector, noble gas mass spectrometer Helix MC *Plus* installed at the Australian National University

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The Helix MC *Plus* noble gas mass spectrometer manufactured by Thermo-Fisher is a 350mm, 120 degree extended geometry, high resolution, multi-collector mass spectrometer for the simultaneous analysis of noble gas isotopes. The detector array includes a fixed axial (Ax) detector, 2 adjustable high mass (H1 and H2) detectors and 2 adjustable low mass (L1 and L2) detectors, with Faraday and CDD collectors equipped on each detector. The H2, Ax and L2 detectors installed in the Helix MC *Plus* at the Australian National University (ANU) are of high mass resolution, and the L2 Faraday detector is equipped with a $1\text{E}13 \Omega$ amplifier with a noise level less than $5\text{E}-18 \text{ A}$.

Here we report the commissioning work of the Helix MC *Plus* noble gas mass spectrometer installed at the ANU. The performance of the mass spectrometer in mass resolution, sensitivity, reproducibility and linearity has been examined, and the results are presented. Comparison of these results with those of conventional noble gas mass spectrometers is given. The application of the five detectors in measuring various noble gas isotopes in multi-collector modes is discussed. The integration of software drivers of devices on the noble gas extraction line into the controlling program Qtegra of the mass spectrometer is described in this paper.

The observed high mass resolution (higher than 1,800) and mass resolving power (higher than 8,000) make this mass spectrometer unique in applications in noble gas geochemistry. It provides the possibility to measure isobaric interference free noble gas isotopes. This renovation in noble gas mass spectrometry significantly improves the accuracy in determining the isotope ratios. In addition, the multi-collectors of the mass spectrometer greatly increase the efficiency in acquiring data for various noble gas isotopes.