

Optimizing MS/MS Parameters in Neoma MS/MS for High-Precision Isotope Analysis

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Multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) has significantly advanced high-precision isotope analysis in geochemistry. The Neoma MS/MS, equipped with a tandem mass spectrometry (MS/MS) module, offers improved control over ion transmission and interference removal. However, optimizing its MS/MS parameters is essential to maximize analytical performance, particularly in enhancing sensitivity and ensuring isotopic accuracy.

This study systematically investigates the effects of key MS/MS parameters, including ion optics tuning, slit width, E-field, and B-field. Using reference materials, we evaluated the sensitivity and accuracy of Neoma MS/MS under varying conditions. The optimization process focused on fine-tuning these parameters to maximize sensitivity and ensure high analytical accuracy.

Our results indicate that: (1) adjusting the slit width, E-field, and B-field effectively reduces Ar ion interference, thereby mitigating space charge effects in the ion transmission pathway and improving isotope analysis sensitivity; (2) Focus Lens 2 plays a critical role in isotope ratio accuracy, with its influence becoming more pronounced at higher B-field settings, making isotope ratios more sensitive to voltage fluctuations; (3) despite the standardized design of Neoma MS/MS, slight performance variations exist between individual instruments. Consequently, replicating reported parameter settings without validation may not yield optimal results. Instead, instrument-specific optimization is necessary to achieve the best interference removal and analytical precision.

Overall, this study provides a systematic framework for optimizing the MS/MS module in Neoma MS/MS, ensuring enhanced sensitivity and accurate isotope ratio analysis. These findings emphasize the importance of tailored parameter adjustments for each instrument, offering valuable guidance for researchers utilizing Neoma MS/MS in geochemical studies.