Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37044

# High-throughput Ca isotope measurements using Neoma MC-ICP-MS/MS: evaluation of $H_2$ and $SF_6$ reaction gases

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We report ~1,000 Ca isotope measurements performed between May 2024 and October 2025 using a Neoma MC-ICP-MS/MS coupled to a microFAST Isotope 2 continuous-flow system and operated in dry plasma mode. With $H_2$ in the collision/reaction cell, sensitivity reaches 500–1,000 V/ppm for $^{40}Ca$ (low resolution) with noise-to-signal ratios of ~0.2%. Long-term reproducibility (±2SD, n = 716) is 120 ppm ($^{44}Ca/^{40}Ca$), 130 ppm ($^{43}Ca/^{40}Ca$), 80 ppm ($^{42}Ca/^{40}Ca$) and 70 ppm ($^{44}Ca/^{42}Ca$).

Systematic tests over six analytical sessions demonstrate that concentration and matrix mismatches between samples and standards generate session-dependent offsets, both positive and negative, confirming that these effects are not instrument-specific. Mismatch effects are efficiently corrected by adjusting the injection flow rate. Accuracy is validated using ten certified reference materials covering diverse biological matrices.

Although $Sr^{2+}$ double-charge interferences are corrected up to Sr/Ca ratios of 1–2% by monitoring $^{87}Sr^{2+}$, we further evaluate $SF_6$ as a reaction gas to suppress such interferences. With $SF_6$, sensitivity decreases to ~100 V/ppm, while blank/signal ratios remain ~0.2%. Reproducibility (±2SD, n = 265) is 140 ppm for $^{44}CaF/^{40}CaF$ and 90 ppm for $^{42}CaF/^{40}CaF$. Notably, the $^{42}CaF/^{40}CaF$ ratio is insensitive to concentration mismatches up to 30% and to $Sr^{2+}$ interferences up to Sr/Ca ratios of 20%. However, $^{44}CaF$ does not follow strictly mass-dependent behavior, yielding $\delta^{44/40}CaF$–$\delta^{44/42}CaF$ correlations with slopes ~1 rather than ~2.

The analytical robustness of $^{42}CaF/^{40}CaF$ highlights strong potential for high-throughput Ca isotope analysis in solution and future laser-ablation applications.