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Laser-ablation Sr isotopic analyses of small glass samples using MC-ICPMS
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An analytical protocol was developed for correcting Kr baseline-induced bias and Rb isobaric overlap factors to analyze Sr isotope ratios for small glass samples using laser ablation (LA) with a desolvating nebulizer dual-intake system and MC-ICP-MS. The combined use of a low-oxide interface setup along with high-gain Faraday amplifiers with a 10^{12} Ω resistor enabled precise determination of Sr isotope ratios from 50-100 μm diameter craters using 10 Hz laser repetition rate. Residual analytical biases of $^{84}Sr/^{86}Sr$ and $^{87}Sr/^{86}Sr$ isotope ratios induced from Kr baseline suppressions (Kimura et al., 2013), were found to be nonlinear, but the correction method was applicable to 50-200 μm/10 Hz craters. We also found that the $^{85}Rb/^{87}Rb$ overlap correction factor changed with time with a change in the surface condition of sampler-skimmer cones. The correction factor of $^{85}Rb/^{87}Rb$ was thus determined at least once per five unknown measurements using the nebulizing intake line. We determined $^{87}Sr/^{86}Sr$ isotope ratios from MkAn anorthite (Sr = 305 ppm, Rb = 0.07 ppm), BHVO-2G, KL2-G, ML3B-G (Sr = 312-396 ppm, Rb = 5.8-9.2 ppm), and BCR-2G (Sr =337 ppm, Rb =48.5 ppm) basalt glasses using a 50-100 μm/10 Hz crater. The results agree well with their reference values determined by thermal ionization mass spectrometry, even with the high Rb/Sr ratio (0.14) in the BCR-2G glass. The internal/intermediate precisions were ±0.0002 (two-standard deviation: 2SD) for 100 μm craters and ±0.0005 for 50 μm craters. The new instrument settings and analytical protocol improved the precision by a factor of two compared to the previous report using LA-(sector field)-ICP-MS and enables the analysis of sample volumes that are ten times smaller than those used in previous LA-MC-ICP-MS analyses with equal precision.

キーワード: Sr isotope, geological glasses, LA-MC-ICP-MS, Kr baseline-induced bias, Rb overlap correction
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