

Determination of $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratio in different rock types with ICP-MS/MS

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Strontium isotope system, especially $^{87}\text{Sr}/^{86}\text{Sr}$ ratio, is one of the most established and commonly used systems in geochronology and a diverse range of geology disciplines. However, classic method for accurate analysis of Sr isotope ratio with MC-ICP-MS and TIMS requires a time-consuming column chemistry stage to separate the isobaric interferences of ^{87}Rb over ^{87}Sr , which is not ideal for a large sample volume. Hence, developing an easier method for accurate $^{87}\text{Sr}/^{86}\text{Sr}$ ratio analysis is needed for geological survey type of studies.

Since the development of the triple quadrupole ICP-MS (ICP-MS/MS) instrument, several studies had demonstrated that $^{87}\text{Sr}/^{86}\text{Sr}$ ratio could be determined to a certain level of accuracy with it¹⁻³. To investigate this technique for geological survey studies, different types of rock exposed in the upper crust were acid digested and measured with both classic MC-ICP-MS method and oxygen reaction mode ICP-MS/MS for comparison.

For developing the ICP-MS/MS method, geological standard reference materials (SRMs, i.e. BCR-2, AGV-2 and BHVO-2) were used to modify instrument settings and to assess the accuracy of results. The typical 2sd of the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of these SRMs, during a 20-hour batch run, is approximately 0.0008, and the ratio is typically within 0.03% RSD of literature data⁴. The $^{87}\text{Sr}/^{86}\text{Sr}$ ratio results of rock samples between the ICP-MS/MS method (no column chemistry) and MC-ICP-MS method (with column separation), variation of below 0.04% RSD for ICP-MS/MS method could be obtained, which highlights its potential usefulness in geological survey studies with a great many samples.

References: 1) T. Zack and K. J. Hogmalm, *Chem. Geol.*, 2016, 437, 120–133; 2) E. Bolea-Fernandez et al., *J. Anal. At. Spectrom.*, 2016, 31, 303–310; 3) K. J. Hogmalm et al., *J. Anal. At. Spectrom.*, 2017, 32, 305–313; 4) K.P. Jochum et al., *Geostand. Geoanal. Res.*, 2005, 29, 333-338.