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Strontium Isotope Amount Ratios in a Biological Tissue as Candidate Reference Material using MC-ICPMS

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A fully validated protocol is described for the accurate and precise determination of Sr isotope amount ratios in the TORT-3 candidate lobster hepatopancreas certified reference material (CRM) from the National Research Council Canada assessed by multiple collector-inductively coupled plasma mass spectrometry (MC-ICPMS). This CRM represents a complex biological matrix widely used for trace metal analyses. Parameters affecting the separation of Sr and Rb as well as of other matrix elements based on a double pass of the dissolved sample matrix through a column packed with Eichrom Sr Spec resin were investigated in detail. Fractionation on the column was eliminated as quantitative recovery (98 ±4 % mean and 1 SD, n=18) of strontium was obtained. A modified method of standard-sample bracketing with internal normalization for mass bias correction was employed using natural Zr added to both the sample and a solution of NIST SRM 987 used as the bracketing standard. Each ^{i}Sr/^{86}Sr ratio (^{88}Sr/^{86}Sr, ^{87}Sr/^{86}Sr and ^{84}Sr/^{86}Sr) was used to separately calibrate an individual ^{91}Zr/^{90}Zr ratio, which was then used to correct corresponding ^{88}Sr/^{86}Sr, ^{87}Sr/^{86}Sr and ^{84}Sr/^{86}Sr ratios in the sample. NIST SRM 987 standard solutions used for method validation returned ratios in good agreement with their certified values, confirming the accuracy of the approach. Absolute isotope amount ratios of 0.056526 ±0.000048, 0.70937 ±0.00010 and 8.3824 ±0.0012 (U, k=2) for ^{84}Sr/^{86}Sr, ^{87}Sr/^{86}Sr, ^{88}Sr/^{86}Sr, respectively, were obtained in TORT-3. The main contributors to the combined uncertainties of the TORT-3 Sr isotope ratios are the certified values in NIST SRM 987. Values of -0.442 ±0.071 ‰, -1.363 ±0.036 ‰, and 0.454 ±0.030 ‰(mean and 1 SD, n=18) characterize $\delta^{84/86}$Sr, $\delta^{87/86}$Sr and $\delta^{88/86}$Sr, accordingly.