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# High Precision Zinc Stable Isotope Composition of Certified Biological Reference Materials

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## Abstract

Certified reference materials (RMs) with well-characterised stable isotope ratios are essential for method validation and routine quality control of stable isotopic analyses. With a growing number of studies investigating the application of stable isotope measurements to biomedical research (e.g., for disease diagnosis, prognosis and biomarker development), biological RMs are needed to ensure laboratories produce data of comparable quality.

We have obtained high precision Zn stable isotope compositions for five certified biological RMs issued by IRMM: fish muscle, bovine muscle, pig kidney, human hair and human blood serum. Samples were broken down by microwave-assisted acid digestion and Zn was isolated by anion exchange chromatography. Using the double-spike technique, Zn isotope ratios were then measured by MC-ICP-MS, relative to the pure Zn solution IRMM-3702. The Zn solutions London Zn and JMC-Lyon Zn were also analysed, for quality control. Furthermore assessed were the (i) sensitivity of high precision  $\delta^{66}/^{64}\text{Zn}$  measurements to variations in double-spike to sample ratio (S/N), (ii) efficiency of the Zn separation procedure and (iii) measurement accuracy at different MC-ICP-MS mass resolution settings.

Over nine months, biological RM analyses yielded mean  $\delta^{66}/^{64}\text{Zn}$  values with external precisions (2sd) of about  $\pm 0.05$  to  $\pm 0.10$ . This suggests only very minor heterogeneities in Zn isotope composition are present at the sampled scale (50-200 mg). All RMs, except the blood serum, have Zn isotope compositions that fall within the range of normal natural values. The low  $\delta^{66}/^{64}\text{Zn} = -3.29 \pm 0.12$  of the blood serum reflects the addition by IRMM of Zn solution NIST SRM-3168a. The analyses also showed that (i) constant  $\delta^{66}/^{64}\text{Zn}$  values are obtained over a relatively large range of S/N values (at least  $\pm 25\%$ ) and (ii) medium mass resolution ( $M/\Delta M \approx 8500$ ) is not required to resolve spectral interferences, which is advantageous as the sample size for biological tissue is often limited.

**Keywords:** Zn, stable isotopes, double spike, biological reference materials, Multiple Collector Inductively Coupled Plasma Mass Spectrometry, IRMM

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