Intercomparison of δ^{26}Mg values in Mg isotope RMs and standards to a new isotope RM traceable to the SI

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Accurate measurements of stable isotope abundance ratio variations are often reported using artifact based δ-scales, which rely on suitable isotopic reference materials (iRM) for their realization. For example, variations in the $^{26}Mg/^{24}Mg$ isotope abundance ratio in natural systems are typically reported as δ^{26}Mg values that represent the relative difference between the $^{26}Mg/^{24}Mg$ ratio measured in a sample relative to its measurement preferably in an iRM. In the past, such δ^{26}Mg measurements were referenced to NIST SRM 980, the initial zero of the δ^{26}Mg scale. With the development of MC-ICPMS, the detection of small but measurable isotopic differences in different chips of SRM 980 became apparent. It was then replaced by an Mg solution (DSM3), the new zero of the δ^{26}Mg scale. A potential replacement iRM for DSM3 has been developed, ERM-AE143. This iRM has also been measured for its absolute isotope amount ratios[1,2] making it traceable to the SI.

The results of our δ^{26}Mg intercomparison experiment include the Mg iRMs SRM 980, IRMM-009, ERM-AE143, AE144, AE145 standards DSM3 and Cambridge-1. The intercomparison involved 5 expert laboratories, consisting of 3 metrological institutes (BAM, NIST, PTB) and 2 scientific research laboratories (GFZ Potsdam, UBremen).

The iRMs were measured relative to AE143 and cover a range of ≈5 ‰ in δ^{26}Mg. IRMM-009 has the lowest δ^{26}Mg value while DSM3 has the highest, spanning a range in values that covers natural Mg isotope variations. The 2SD reproducibilities of the individual values from the different laboratories range from 0.02 to 0.26 ‰. The mean δ^{26}Mg values, calculated from the laboratory means however show 2SD reproducibilities varing between 0.03 and 0.10 ‰. Propagated measurement uncertainties suggest a standard uncertainty of about 0.1‰ for δ^{26}Mg determinations.

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