

Scaling NIST SRM 3149 for Se isotope analysis and isotopic variations of natural samples.

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There is actually no consensus on what material should be used as the "delta zero" reference for Se isotope analysis. Some concerned scientists suggested the use the NIST SRM 3149. Here we report its composition (lot 992106) relative to a MERCK Se solution which was already used as reference [1]. The technique used is the on line, continuous flow hydride generation, coupled to a MC-ICP-MS Isoprobe, equipped with a collision cell, as described by [1]. The $\delta^{82/76}\text{Se}_{\text{MERCK}}$ measured for the NIST SRM 3149 is -1.53 ± 0.20 (\pm is 2 times the standard deviation from the mean, $n=31$, 11 sessions). Recalculated $\delta^{82/76}\text{Se}$ relative to NIST for MERCK, CRPG and MH495 Se solutions are then respectively $1.53 \pm 0.20\text{‰}$, $2.01 \pm 0.2\text{‰}$ (2.06 ± 0.11 measured, $n=3$) and $-3.04 \pm 0.30\text{‰}$.

Literature values ($\delta^{82/76}\text{Se}$) may be recalculated in the NIST 3149 scale. Troilite from various iron meteorites and mafic terrestrial rocks yield an average composition of zero per mil with a small variation of $\pm 0.39\text{‰}$ and of $\pm 0.72\text{‰}$ respectively. Sediments have a slightly larger range in composition ($0.39 \pm 1.11\text{‰}$). Sulfides from modern hydrothermal fields and from various black shales yield rather negative average values of $-1.26 \pm 2.6\text{‰}$ and $-0.57 \pm 4.9\text{‰}$ and relatively large range in compositions. New results obtained at CRPG laboratory on black shales revealed high variations of their $\delta^{82/76}\text{Se}_{\text{NIST}}$, from -12.9‰ to 4.9‰ . In these specific rocks, Se occurs as different chemical forms (Se^{-2} and Se^0). Se isotopes are then sensitive to the alteration cycle of rocks and subsequent phase transformations related to redox conditions.

References

[1] Rouxel O., Ludden J., Carignan J., Marin L. and Fouquet Y. (2002) *GCA* **66**, 3191-3199.