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High precision cadmium isotope measurement by double spike MC-ICP-MS

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High precision cadmium (Cd) isotope measurement method by double spike MC-ICP-MS was developed using a Nu Plasma II MC-ICP-MS through an Aridus II desolvator in the Laboratory of Isotopic Geology, Institute of Geology, Chinese Academy of Geological Sciences. A modified purification scheme was employed for Cd separation using AGMP-1M resin (Bio-rad, 100–200 mesh), and Cd was eluted in 10 mL H_2O. Rudge et al. [1] indicate that the optimal composition of a double-spike is ^{106}Cd-^{111}Cd, and ^{106}Cd: ^{111}Cd = 54: 46. The ^{106}Cd-^{111}Cd double-spike was prepared as a mixture of two concentrated spikes ^{106}Cd and ^{111}Cd spikes (99.57% and 97.21% purity, respectively; ISOFLEX, USA); The ^{106}Cd-^{111}Cd double-spike were calibrated using NIST 3108 assuming $^{111}Cd/^{110}Cd_{true}$ = 1.02594 [2], instrumental mass-dependent fractionation follows an exponential law. A $Cd_{spike}/(Cd_{sample} + Cd_{spike})$ ratio of 0.2 ~ 0.5 was adopted. High concentrations of Mo Ni and Se, up to values equaling the Cd concentration, do not affect double-spike-corrected Cd isotope analyses significantly, whereas Zn and In interference leads to erroneous $\delta^{114/110}$Cd values with Zn/Cd ratios > 0.1 and In/Cd ratios > 0.1. Up to 200% concentration difference between samples and standards yields results which are still close to zero within analytical uncertainty. Cd isotope measurements using the double spike correction are not sensitive to the molarities of the diluted HNO_3. Cd isotopes of Spex-CUGB Cd, Münster Cd, and BAM I012 Cd were measured and their $\delta^{114/110}$Cd (‰) are -2.149 ± 0.063, 4.486 ± 0.064, -1.371 ± 0.042, respectively, which are consistent with published data. Cd isotopes were determined for BCR-2, SGR-1b, NOD-A-1, NOD-P-1, NIST 2710a, NIST 2711a, and yield $\delta^{114/110}$Cd (‰) of -0.071 ± 0.010, 0.146 ± 0.032, 0.035 ± 0.027, 0.071 ± 0.039, 0.581 ± 0.008, 0.019 ± 0.018, respectively. Cd isotopes of NIST 2711a is heavier than, and others are consistent with published data.

References

[1] Rudge JF, et al. (2009), *Chemical Geology* 265, 420–431.

[2] Abouchami W, et al. (2013), *Geostandards and Geoanalytical Research* 37, 5–17.