Geocosmochronometer ^{146}Sm: A revised half-life value

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Alpha-decaying nuclide ^{146}Sm, now extinct, was extant in the Early Solar System (ESS) [1] and was proposed as a cosmochronometer measuring the time between *p*-process nucleosynthesis and ESS condensation. Positive isotopic anomalies in the ^{142}Nd daughter have been measured in Earth rocks [2] and in Moon [3] and Martian meteorite [4] samples, relative to chondritic meteorites. This indicates that geochemical fractionation between Sm and Nd occurred while ^{146}Sm was still live, possibly during mantle differentiation. These issues stress the importance of ^{146}Sm half-life, determined as $(1.03\pm0.05)\times10^8$ yr [5, 6]. We have performed a new determination of the ^{146}Sm half-life by measuring both alpha-activity ratio and atom ratio of ^{146}Sm to ^{147}Sm ($t_{1/2}$= $(1.07\pm0.09)\times10^{11}$ yr [7]) in artificially activated ^{147}Sm. The new value of ^{146}Sm half-life, $(0.68\pm0.07)\times10^8$ yr, is significantly shorter than previously measured and will have interesting implications for the chronology of *p*-process and planetary differentiation. The experimental determination of ^{146}Sm half-life will be described and discussed.

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[1] Prinzhofer, Papanastassiou & Wasserburg (1992) *GCA* **56**, 797–815. [2] O'Neil *et al*. (2008) *Science* **321**, 1828–1831. [3] Boyet & Carlson (2007) *EPSL* **262**, 505–516. [4] Caro *et al*. (2008) *Nature* **452**, 336–339. [5] Friedman *et al*. (1966) *Radiochim. Acta* **5**, 192–194. [6] Meissner *et al*. (1987) *Z. Phys. A* **327**, 171–174. [7] Kossert *et al*. (2009) *Appl. Rad Iso.* **67**, 1702–1706.

Recycling of subducted sediments traced by HFSE and W systematics of K-rich mafic Aegean lavas

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Tungsten and other similar incompatible HFSE and LILE (Nb, Ta, Zr, Hf, Ba, Th, U) have been shown to be valuable monitors for assessing the flux of subducted sediments in arc systems [1]. In subduction-related tectonic settings, basalts of the K-rich series (medium-K, high-K and shoshonitic) are considered as the most incompatible element-rich endmembers, commonly being interpreted as tapping mantle sources that underwent a substantial flux of melts or fluids from subducted sediments. In order to constrain the behaviour of the extended HFSE group in the sources of K-rich lavas, we performed high-precision measurements of Nb- Ta-Zr-Hf and W concentrations by isotope dilution and MC-ICPMS on K-rich lavas from the Eo-Oligocene Eastern Rhodope province, Bulgaria and on mafic calc-alkaline lavas from the active Aegean Island arc (Santorini). Both suites share similar petrogenetic characteristics in that their sources were contaminated by subducted sediments from the African plate.

The concentrations of HFSE are enriched in all suites (e.g. 0.3 to 4.2 ppm W), similar to other incompatible elements such as K. The HFSE ratios of virtually all samples lie well within the MORB array (Nb/Ta = 12.8 – 15.1, Zr/Hf = 39.5 – 41.7). Only the absarokites exhibit elevated Nb/Ta (19.1 – 20.1) reflecting fractionation of phlogopite. The samples also exhibit lower Ta/W than MORB (0.19 to 0.68), similar as found for other arc suites [1].

The extended HFSE systematics for both Santorini and Bulgarian rocks can help to discriminate between different types of source overprint: lavas from Santorini, where source enrichment is controlled by melt-like components, exhibit consistently low W/Th (ca. 0.07), somewhat lower than MORB (ca. 0.15). In contrast, the HFSE and W budget in the Bulgarian K-rich rocks is dominated by both fluid- and melt-like components, and W/Th exhibit a large range from 0.07 to 0.3. Our data therefore confirm that W/Th in arc lavas can only be elevated in the presence of fluid-like subduction components. Conversely, in melt-controlled subduction regimes, W appears to behave slightly less mobile than Th.

[1] König *et al*. (2008) *EPSL* **274**, 82–92.