Revisiting the Ti isotope inventory of the Moon

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Titanium isotope ratios are being established as a genetic tracer for nucleosynthetic heritage [1, 2]. Different solar system bodies show significant mass-independent differences, primarily in ε^{50}Ti [2]. Of particular interest are possible variations within the Earth-Moon system. Secondary neutron capture reactions, however, may significantly bias genetic interpretations of Ti isotope data [1]. We here re-assess the extent of such bias and possible genetic implications of the ε^{50}Ti of lunar rocks.

We present whole rock ε^{50}Ti (high-resolution), μ^{180}Hf, and ε^{149}Sm MC-ICP MS data for a suite of lunar samples ranging from KREEP to low-Ti and high-Ti mare basalts and covering a wide spectrum of exposure to galactic cosmic rays. Repeated analyses of NIST SRM 3162a yield an external reproducibility (2 s.d., N = 27) for interference- and mass bias corrected ε^{50}Ti of ± 0.26 ε-units. Our data show that ^{50}Ti correlates well (MSWD = 0.1, N = 3) with proxies for epithermal (μ^{180}Hf) and thermal (ε^{149}Sm) neutron capture [3, 4]. The zero-exposure ε^{50}Ti of our lunar sample suite agrees well with that of terrestrial rock standards, irrespective of the neutron capture proxy used in its determination. In the most extreme case, our data suggests a maximum difference of 12 ppm in Earth-Moon system for ε^{50}Ti.

[1] Zhang *et al.* (2012), *nature geoscience* **5**, 251-255. [2] Trinquier *et al.* (2009), *Science* **324**, 374-376. [3] Sprung *et al.* (2010) *Earth and Planetary Science Letters* **295**, 1-11. [4] Sprung *et al.* (2013), *Earth and Planetary Science Letters* **308**, 77-87