In Quest of REE Nucleosynthetic Anomalies using High Precision Isotope Measurements by TIMS

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The accessible silicate Earth is characterized by a ^{142}Nd excess of ~20 ppm relative to chondrites [e.g. 1]. This excess has been interpreted as the result of 'in situ' radioactive decay of ^{146}Sm ($t_{1/2}$ ~ 103 Myr), suggesting a global differentiation of the Earth's mantle within the first 30 Myr of the Solar System. However, recent studies [e.g. 2, 3] have shown that the Earth is also enriched in the non-radiogenic Nd isotopes, which are produced by the slow neutron capture process of stellar nucleosynthesis (s-process). ^{142}Nd mainly is a s-process product, and, hence, a portion of terrestrial ^{142}Nd excess relative to chondrites can be nucleosynthetic, instead of radiogenic, in origin. Based on the correlations between the relative abundances of ^{142}Nd and non-radiogenic Nd isotopes of Earth and chondrites, it has been concluded that nucleosynthetic effect can entirely account for terrestrial ^{142}Nd excess, which would then have no chronological significance with repect to the Earth's mantle differentiation [2, 3]. These authors also reported Sm isotopic variations, which seem to be correlated with the Nd isotopic variations, but the limited precision of these analysis precludes to precisely estimate a nucleosynthetic correction on ^{142}Nd using Sm isotopes.

To further constrain the nucleosynthetic contribution to ^{142}Nd variations among Solar System objects, we developed new ultra-high precision analytical techniques on a *Triton* thermal ionization mass spectrometer at *LGL* for measuring Sm and Dy isotopes. Repeated measurements of Sm (n=10) and Dy (n=8) *Alfa Aesar* standard solutions yield external reproductibility (2σ SD) of ±5 ppm on $^{144}Sm/^{152}Sm$ and ±7 ppm on $^{160}Dy/^{161}Dy$, which is >5 times more precise than previous studies [2, 3, 4]. We will now investigate high precision Sm and Dy isotopic variations between terrestrial samples, ordinary chondrites, enstatites chondrites and carbonaceous chondrites and their potential relationship with Nd isotopic variations.

[1] Boyet et al., *Science*, 2005; [2] Bouvier and Boyet, *Nature*, 2016; [3] Burkhardt et al., *Nature*, 2016 ; [4] Brennecka et al., *LPSC XXXXV*, 2014.