Nd and Sm isotopic composition of ordinary chondrites

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Using radiogenic chronometers to constrain early differentiation on planetary bodies requires precise knowledge of the initial conditions, i.e. the composition of material that accreted to form the Earth. For the radiogenic lithophile chronometers ^{176}Lu-^{176}Hf and ^{147}Sm-^{143}Nd, a chondritic uniform reservoir composition or CHUR [1] is used for the reference parameters. For ^{147}Sm-^{143}Nd CHUR is well defined as there is limited variation in Sm/Nd and ^{143}Nd/^{144}Nd for different chondrite groups or petrographic type [2]. However, the composition of CHUR for Lu-Hf systematics has been shown to be dependent on degree of thermal metamorphism experienced by chondrites in the "uniform" reservoir [2].

For ^{142}Nd, the product of the short-lived radionuclide ^{146}Sm ($t_{1/2}$ =103 Myr [3]), a 20 ppm offset in ^{142}Nd/^{144}Nd has been measured between chondrites and the convecting mantle [4-6]. This could be the result of a superchondritic Sm/Nd ratio in the convecting mantle, balanced by a hidden reservoir; a non-chondritic Sm/Nd for the BSE; or nucleosynthetic variation the distribution of ^{146}Sm and/or ^{142}Nd. Constraining the cause and the magnitude of this offset is key in the application of ^{146}Sm-^{142}Nd systematics to differentiation in the early Earth. Isotopic variability of ^{142}Nd/^{144}Nd on the ~ 40 ppm scale has been observed in carbonaceous chondrites [6], and based on observed deficits in the p-process nuclide ^{144}Sm [5] proposed ordinary chondrites as a better reference value. However, with the example of Lu-Hf, the degree of variation in Nd isotopic composition resulting from thermal alteration on the parent body needs to be constrained for ordinary chondrites.

Current ordinary chondrite data for ^{142}Nd/^{144}Nd are limited to analyses of 12 ordinary chondrites with a range of ~15 ppm [4-7]. In addition, not all the petrologic types of ordinary chondrites are sampled. We will present Nd and Sm results from a suite of ordinary chondrites spanning the range of petrologic types.

[1] DePaolo & Wasserburg (1976) *Geophys. Res. Lett.* **3**, 249–252. [2] Bouvier *et al.* (2008) *EPSL* **273** 48-57 [3] Meissner (1987) Z. Physik A. **327**, 171-174. [4] Boyet & Carlson (2005) *Science,* **309,** 576-581. [5] Andresaen and Sharma (2006) *Science*, **314,** 806-809. [6] Carlson *et al.* (2007) *Science* **316,** 1175-1178. [7] Gannoun & Boyet (2011) *PNAS* **108** 7693-7697