Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.4630

A fresh look at the Sm-Nd record of Earth's oldest rocks: the Acasta Gneiss Complex (Northwest Canada)

ALESSANDRO MALTESE[1,2], **GUILLAUME CARO**[1], ERIK E. SCHERER[3], PETER SPRUNG[4], WOUTER BLEEKER[5] AND KLAUS MEZGER[2]

[1]Université de Lorraine, CNRS, CRPG
[2]University of Bern
[3]Westfälische Wilhelms-Universität
[4]Paul Scherrer Institut
[5]Geological Survey of Canada

Presenting Author: caro@crpg.cnrs-nancy.fr

The earliest differentiation of the silicate Earth remains poorly constrained due to the scarcity and imperfect preservation of Earth's oldest rocks. These limitations can be circumvented, however, using the short-lived ^{146}Sm-^{142}Nd system, which provides selective chronological information on Hadean crust-mantle differentiation processes[1]. The oldest rock record on Earth is represented by a chemically diverse suite from the 3.6–4.0 Ga Acasta Gneiss Complex (AGC) in northwest Canada[2,3]. Previous ^{146}Sm-^{142}Nd studies of the AGC revealed the presence of negative ^{142}Nd anomalies, inherited from a so-far elusive Hadean crustal component[4,5,6]. However, the majority of AGC samples define a ^{147}Sm-^{143}Nd regression age of 3.37 ± 0.14 Ga[7], suggesting late disturbance of their Sm-Nd systematics. This issue limits the potential of combined ^{146,147}Sm-^{142,143}Nd investigations to reveal the timing of Hadean crust-mantle differentiation.

We will present coupled ^{146,147}Sm-^{142,143}Nd systematics of layered gneisses from the AGC in combination with zircon U-Pb age constraints. The results for the short-lived ^{146}Sm-^{142}Nd system show μ^{142}Nd values ranging from +2.7 to −8.5 ppm (±2.5 ppm, 2 S.D.) and document the existence of both mantle and Hadean crustal components within the sources of the AGC. The data for the long-lived ^{147}Sm-^{143}Nd system deviate from the ~3.4 Ga regional array, defining an apparent age of 4.01 Ga[8], which may be geologically meaningless. Although the actual sample ages still need to be further constrained by forthcoming zircon data, our results suggest that the studied samples preserve a record of primary ^{142,143}Nd heterogeneities in the AGC and shed some light on the petrogenetic history of Earth's oldest rocks.

[1] Harper & Jacobsen (1996) *Nature*, 360, 728-732. [2] Stern & Bleeker (1998) *Geosci. Can.*, 25**,** 27-31. [3] Bowring & Williams (1999) *Contrib. to Mineral. Petrol.*, 134, 3-16. [4] Roth et al. (2014) *GGG*, 15, 2329-2345. [5] Reimink et al. (2018) *EPSL*, 494, 12-22. [6] Emo et al. (2018) *GCA*, 235, 450-462. [7] Moorbath et al. (1997) *Chem. Geol.*, 135, 213-231. [8] Scherer et al. (2010). *AGU Fall*, V44B-01.