

Rare earth element distribution and Lu-Hf and Sm-Nd isotopic effects in Antarctic H and CM chondrites

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The redistribution of rare earth elements (REEs) and other large ion lithophile elements during planetary processes has strong effects on the Lu-Hf and Sm-Nd isotope systems, as observed in a wide range of chondritic and achondritic materials [1]. However, the relative mobility of these elements during aqueous alteration or thermal metamorphism on their parent bodies, as well as during weathering in hot and cold desert remain poorly understood, even in the case of common chondrites [2]. In this study, the results of Lu-Hf and Sm-Nd isotope systematics in Antarctic H chondrites and CM chondrites are examined in a methodical manner.

In this first step, ten Antarctic H chondrites from H3.0 to H7 and two CM chondrites (CM and CM2) are studied for their REE distribution and subsequently analyzed for these isotope systems using ICP-OES, Q-ICP-MS and MC-ICP-MS. Three H chondrites obtained from hot deserts are also considered to quantitatively constrain any weathering effects. Corresponding polished thick sections have also been investigated for the REE distribution using micro-XRF and LA-ICP-MS/TOF. According to the first micro-XRF results, Ca-phosphates in unequilibrated H chondrites are much less abundant (0.43 ± 0.12 vol. %, $n=7$) than in equilibrated H chondrites (0.81 ± 0.10 vol. %, $n=6$). Based on published isotopic data [3, 4], there is a small but significant difference in $^{176}\text{Hf}/^{177}\text{Hf}$ between unequilibrated and equilibrated chondrites of the same meteorite class. This isotopic shift may result from a difference in the modal abundances of Ca-phosphates between these groups because Ca-phosphates are known to be an important host phase of REEs in equilibrated ordinary chondrite [5, 6].

- [1] P.J. Patchett and M. Tatsumoto (1980), *Nature* **288**, 571–574. [2] M. Tatsumoto *et al.* (1981), *Memoirs of NIPR. Special issue* **20**, 237-249. [3] A. Bouvier *et al.* (2008), *EPSL* **273**, 48-57. [4] P.J. Patchett *et al.* (2004), *EPSL* **222**, 29-41. [5] M. Ebihara and M. Honda (1983) *EPSL* **63**, 433-445. [6] V. Debaille *et al.*, (2017) *EPSL* **473**, 52-61.