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Heavy REE fractionation in chondrites, achondrites and planets.

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Refractory elements are regarded to occur in “chondritic abundances” in asteroids and planets. We have re-analyzed the REE abundances in a large set of meteorites (chondrites, achondrites) and terrestrial samples using a newly developed analytical technique. In brief, bulk rock powders are laser heated and melted using an aerodynamic levitation device [1]. No flux is added and <10 mg of rock powder is required. Samples are then embedded in resin along with CI1 chondrites for direct comparison. The REE abundances are then analyzed by LA-ICPMS. We show that rocks from Earth, Moon, Mars, differentiated asteroids, EC, OC and RC have a distinct 5 % depletion in Tm relative to relative to CI1 meteorites. Other carbonaceous chondrites show highly variable REE patterns.

The chemical dichotomy described here mirrors the isotopic dichotomy [2]. We suggest that CI1 chondrites are not a suitable reference for high-precision studies of REE (including Tm) for planetary and non-carbonaceous-chondrite meteorites.

[1] Pack et al., *Geochem. Trans.* (2010) [2] Warren, *EPSL* (2011).

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