

Chromium isotopic variations in magmatic iron meteorites

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The chemical compositions of the mantles of the terrestrial planets carry the record of core formation processes in their siderophile and moderately siderophile element abundances. Magmatic iron meteorites are thought to be derived from the cores of early planetary embryos and provide a complementary archive of information. The variations in their minor and trace elements concentrations have been used to constrain core formation processes and provide analogues for studying the Earth [e.g. 1, 2]. Mass dependent stable isotope fractionation has been studied to elucidate the processes happening during core formation. Isotopic effects have been found for V but they appear to be too large to be caused by core formation [3]. In contrast, Si shows small effects consistent with core formation [4]. Chromium is a moderately siderophile element about 60% of which is in the Earth's core. It was recently demonstrated that the Cr isotopic composition of the silicate Earth is not fractionated by core formation [5].

In this study 18 magmatic iron meteorites have been analysed for their stable mass dependent and mass independent Cr isotopic compositions. The results obtained show that magmatic iron meteorites are isotopically heavier than the bulk silicate Earth [6] and average chondritic compositions [5]. These variations are correlated with indices of fractional crystallisation. Some of the analysed samples have been affected by secondary processes and ingrowth of ⁵³Cr and ⁵⁴Cr due to cosmic ray exposure. The data presented are used to constrain the processes responsible for the variation in Cr concentration in iron meteorites such as fractional crystallisation, especially the influence of chromite. Mass dependent Cr isotopic variations between the four studied groups are explored to determine whether the early Solar System was heterogeneous in term of Cr isotopes.

[1] Scott and Wasson 1975 *Rev. Geophys.*, 13, 527-546, [2] Goldstein *et al.* 2009 *Chemie der Erde* 69 293-325, [3] Nielson *et al.* 2014 *EPSL* 389 167-175, [4] Savage *et al.* 2014 *Lithos*, 190 500-519, [5] Bonnand *et al.* 2016 *EPSL* 435 14-21, [6] Schoenberg *et al.* 2008, *Chem. Geol.* 249 294-306.