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In Situ δ^{56}Fe Analysis of Chondrite Components

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In this study, we investigated the Fe isotope composition of opaque phases in ordinary and CB chondrites and of a Kainsaz (CO3) chondrule. These are the first in situ analyses of meteorite components performed by a solution-coupled femtosecond-LA-MC-ICPMS. We achieved a spatial resolution of <15 µm for δ^{56}Fe pofiles with 2SD of ~0.1‰.

The analyses of over 250 opaque grains in OCs revealed systematic variations between (1) major opaque phases (2) chemical groups and (3) petrological types, with a total spread in δ^{56}Fe of 1.8‰. These variations exceed former findings [1, 2] and indicate re-eqilibration at different cooling rates.

As previously reported [1], large Fe-Ni metal aggeregates in CB chondrites are homogeneous in δ^{56}Fe, but small aggregates show a strong zoning –of ~ 7‰ which is negatively correlated with their Ni content, indicating a condensation origin.

The CO3 chondrule showed zoning in δ^{56}Fe of 1.2‰ which is positivley correlated with FeO and likely generated by Fe diffusing into the chondrule.

[1] Needham, A.W. et al. (2009) GCA 73, 7399–7413. [2] Theis, K.J. et al. (2008) GCA 72, 4440–4456. [1] Zipfel, J. and Weyer, S. (2007) LPSC.

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