COMBINED FE- AND SI-ISOTOPE MEASUREMENTS IN CV CHONDRITE CHONDRULES.

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The Fe- [1] and Si-isotopic [2] compositions of all solar system materials analysed so far plot on a single mass-dependent fractionation line in 3-isotope space. However, individual components like chondrules and CAIs show one of the largest spreads in Fe- [1,3-6] and Si-isotopic compositions [2,7-8]. The Fe-isotopic compositions of chondrules spread from negative (-0.82‰) to positive (+0.32‰) δ^{56}Fe values [8], i.e. chondrules must have been enriched in light and heavy Fe-isotopes [e.g. 5,8]. We analysed 30 bulk chondrules from Allende, Mokoia and Grosnaja and found that their Fe-isotopic compositions do not follow a simple trend when plotted against their bulk FeO-composition or their mass [8]. However, the spread in bulk chondrule δ^{56}Fe narrows with increasing bulk FeO or chondrule mass. A single stage process cannot produce such a spread, which rules out a single parent body process. We performed some simple modelling and found that repeated evaporation and re-condensation - as it is expected to happen in the solar nebula - can explain the observed spread. The conclusion of this modelling is that each chondrule evaporated and re-condensed different amounts of Fe. This can be due to different heating times, peak temperatures during chondrule formation, bulk FeO concentrations and different surface/volume ratios, as all chondrules have different sizes.

However, as we analysed bulk chondrules, it is possible that the Fe-budget of a single chondrule is dominated by the occurrence of metal or sulfide. It has been demonstrated by [9] that the distribution of metal in CR chondrite chondrules is highly heterogeneous and that these chondrules have a large spread in metal abundance. We did not image the chondrules using 3D tomography and it is therefore impossible to state whether the Fe-isotopic composition we measured is the one from the silicate, the metal/sulfide, or a combination of both. We do have bits of the chondrules that we analysed for Fe-isotopes left over and will now attempt to measure their Si-isotopic composition. Si is not contained in metal or sulfide in significant amounts. The comparison of Fe- and Si-isotopic composition will show whether there is a possible contribution of metal or sulfide to the bulk chondrule Fe-isotopic composition. In addition we plan to conduct further bulk chondrule Fe-isotopic measurements. The Natural History Museum in London obtained a new X-ray CT scanner that allows to produce 3D images of the chondrule before it is destroyed for isotope measurements and this technique will help to disentangle the relationship between bulk chondrule Fe-isotopic composition and metal/sulfide abundance in the chondrule.

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