Identification of two distinct presolar carriers using Ba-isotope anomalies of acid-leachates and CAIs

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It has been established that resolvable nucleosynthetic anomalies exist for a number of elements, and that many of these variations are correlated [1] [2]. Although evidence suggests that heterogeneities were generated by unmixing of a previously homogenised disk (c.f. incomplete mixing or late injection), the specific processes are not yet understood. Thermal processing could generate differences by preferential destruction of more fragile grains such as nm-sized presolar silicates, while size sorting might also have an unmixing effect.

We present here a study that is targeted at resolving separate presolar carriers in order to better understand the processes that generated isotopic variability. Our data from leachates of the Ivuna CI chondrite exhibit resolvable excesses in both the lighter (^{130,132}Ba) and heavier (^{135,137,138}Ba) isotopes in early leach steps, consistent with a deficit in an s-process carrier, while the late leach step shows the reverse; these results are in accord with the predicted effects of presolar SiC. In contrast, data collected from two separate FUN CAIs have well-resolved anomalies that cannot be reconciled with only SiC, but instead require an additional presolar component with a distinctly different nucleosynthetic source.

In order to better understand these components and their behaviour during unmixing of disk material we have targeted canonical CAIs with the specific goal of resolving ^{130,132}Ba-isotope anomalies. By measuring these isotopes to better than ±50 ppm it will be possible to determine which presolar carrier is responsible for Ba-isotope anomalies in bulk solar system materials – and by inference for the correlated anomalies observed in other elements.

In addition, we include new acid leachates of the Tagish Lake chondrite, as these exhibit well-pronounced anomalies in other nuclides [3], and thus provide an additional avenue for resolving the distinct signatures of multiple presolar components.

[1] Burkhardt *et al.* (202) *Earth and Planetary Science Letters* **312**, 390-400. [2] Schiller *et al.* (2015) *Geochimica et Cosmochimica Acta* 149, 88-102. [3] Yokoyama *et al.* (2015) *Earth and Planetary Science Letters* 416, 46-55.