Goldschmidt 2022 Abstract (2021).
https://doi.org/10.46427/gold2022.12375

Search for the Carriers of *P*-process Anomalies in Early Solar System Condensates

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Calcium-Aluminum-rich inclusions (CAIs) notoriously exhibit isotopic anomalies of nucleosynthetic origin [1]. These mass-independent isotope effects result from the incomplete homogenization of presolar material in the reservoirs from which CAIs formed. It is generally accepted that the presolar grains carrying these isotope anomalies would have been vaporized due to the high temperatures of the CAI formation region and would not survive as discrete phases. Indeed, so far, presolar grains have only been directly observed in low-temperature meteorite components [2].

Recently, noble gas isotope data in fine-grained CAIs showed that a *s*-process carrier was present in these inclusions [3]. The study further revealed that these presolar grains, possibly sub-micron SiC, were likely to have been incorporated in fine-grained (spinel-rich) CAIs during their formation. Similarly, our most recent step-leaching investigation of fine-grained CAIs revealed extreme Sr isotope anomalies (up to 8% ^{84}Sr excess) in the most refractory fractions [4]. These results support the survival of a discrete unknown carrier of pure *p*-process anomalies.

Here, we present an update on our search for the carrier of these exotic Sr isotope signatures using chemical data and in-situ analyses. The mineralogy of residues and chemistry of the corresponding leachates reveal that feldspathoid alteration phases (nepheline, sodalite) are digested during the initial leaching steps. These host most of the Sr in the CAIs, thus having the largest leverage on the bulk μ^{84}Sr. The third leaching step digests Ca-bearing phases such as melilite, hedenbergite, and grossular, which exhibit μ^{84}Sr anomalies similar to the bulk CAI. The large μ^{84}Sr anomalies in the most refractory leaching fractions appear to be a combination of Sr contributions from diopside and spinel, indicating that either of these can be the carrier, or possibly an inclusion in one of these phases. We are currently undertaking TEM analyses of the refractory residues to search for nm-scale carriers.

References

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